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THE CANADIAN ROUTE TO THE SEA.

A Quebec dispatch announces that there is consternation in trade and shipping circles in Canada over the largely increased rates of marine insurance imposed by the underwriters upon both vessels and cargoes using the St. Lawrence waterways, rates which threaten to nip in the bud the ambitious schemes of the Canadians for the employment of this northern route for the shipment to Europe of the grain crop and fat cattle of the great west. Canada realizes that these increased rates are fully warranted by the number of marine disasters that have occurred since the opening of the present shipping season on the St. Lawrence route and quite understands that her modern dream of depriving the American north Atlantic ports of their grain export trade must remain unfulfilled while the navigation of the St. Lawrence route is so heavily handicapped as it is at present. Strenuous efforts are therefore being put forth for the removal of the dangers attending this route, but the task is a big one, and is increased by the fact that several of the disasters to vessels wrecked this summer while engaged in the Canadian trade occurred as far from the Canadian coast line as the southeast shore of Newfoundland. While the Canadian government is not to blame for the lack of more suitable warnings to navigators on the rocky cliffs of the island colony, it is nevertheless quite true that these wrecks would not have occurred there if the ships in question had been running to some of the American North Atlantic ports instead of to some of those on the St. Lawrence. Therefore, it is quite natural that the St. Lawrence route has the blame for these disasters, and that the dominion government will have to go to the enormous expense of protecting the approaches to the St. Lawrence as far east as the eastern coast line of Newfoundland.

Experience has fully demonstrated that the greatest dangers attending the navigation of the St. Lawrence route are not those met in the gulf or the river from which the route is named, but those others which await navigators passing in or out of the Gulf of St. Lawrence, either to the north or to the south of the island of Newfoundland. The government of the island has prepared a chart showing the number of wrecks that have taken place on and around Cape Race, the southeastern point of Newfoundland. It is estimated that hundreds of lives have been lost and $20,000,000 worth of property destroyed on this coast during the last few years, while this season the frequency of disasters has been greater there than ever before. Five ocean steamships have been destroyed there this year. The first of these steamers was the Ivydene which went ashore near Renews in January. Ship and cargo became a total loss, and one man was drowned. This was followed by the Lucerne disaster in February, when the ship, with the twenty-three people on board, was engulfed in the waves near Bacalieu. In March the big French bark Aquitaine was swept in by fog and current upon the coast and ship and cargo were condemned. In May the steamer Crewe ran aground near St. Shotts, and speedily broke up. A fortnight later came the Leyland steamer Assyrian pounding over the rocks near Cape Race, and three weeks subsequently the Elder-Dempster steamer Lusitania, with 456 passengers, tore out her bottom at Seal Cove. This is a serious showing, considering that only part of the season is past, and the navigation of Belle Isle strait not yet begun. The latter course, which lies to the north of the island, between it and Labrador, is in some respects more dangerous than the other.

The chief cause of the wrecks occurring off the southeastern coast of Newfoundland is the northerly current created by the gulf stream. In the case of the Lusitania it was shown by the testimony of the captain and officers that she was admirably navigated, and that at 4:30 p. m. on the day of her mishap her course was such that she should have cleared Cape Race. But at midnight she was on the rocks, thirteen miles north of that point. The current had been running at the rate of four knots an hour, and had thrown her off her course to the extent mentioned. Warning signals of the most improved kind are needed all along the coast, but the cost of installing them will be very large. The government of Newfoundland is poor and unable to undertake the task, which, after all, is more needed by Canada than by the island. The government has therefore invited Sir Wilfrid Laurier to visit the colony in October, when the Duke and Duchess of York will close their empire-embracing tour with a stop at St. John's, and after the departure of the royal party advantage will be taken of Sir Wilfrid's visit to discuss propositions for combined action by the colony and the dominion toward remedying some of the chief drawbacks to the navigation of the St. Lawrence route.

The Belle Isle course to the north of the island is unsafe up to the latter part of August, on account of the icebergs. The existence of fogs after that period and the funnel shape of the entrance of the straits on either side, with Belle Isle itself occupying the center of the channel, are among the chief dangers to navigation in the latter part of the season. Nearly a score of ocean steamers have gone to ruin there within the past ten years, all with full cargoes of produce and cattle. When the Mariposa was wrecked it was nearly a week before the first news of the disaster was learned, while the Scotman's people were ashore on Belle Isle for four days and nights before a passing ship sighted and embarked them. Hitherto there has been no telegraphic communication with Belle Isle, nor is there yet any attempt to reach the southern or Newfoundland shore of the straits by telegraph. The Canadian government has just completed the construction of a line of telegraph along the north shore of the gulf to Chateau point opposite the western end of Belle Isle, and proposes to lay a cable thence to the island. Its feasibility, however, is more than doubted, and experienced ocean telegraphers insist that such a cable can never withstand the crushing pressure of the ice, which cuts the cables upon the Grand Banks as surely as the season comes around. The efficiency of such a cable may be destroyed for weeks and months together by an iceberg grounding upon it, for they float through the channel up to the end of August. It is suggested that instead of this cable the Marconi system should be installed on the shore of Labrador, north of the straits, by the government of Canada. The Newfoundland government may employ the system on the south shore of the straits, being already in treaty with the Marconi company for the establishment of a series of stations along eastern Labrador, which is owned by Newfoundland and frequented every summer by 30,000 of its fishermen, scattered along its 1,500 miles of seaboard. The wireless system is to be employed for furnishing these fishermen with the earliest news of the movement of the fish. There seems no reason to doubt that this arrangement, applied to the Belle Isle section of the coast, would be more economical and at the same time more satisfactory than the cable now about to be laid by Canada, against the advice of the best local authorities.

DR. VON HALLE ON AMERICAN SHIP YARDS.

Dr. Ernst von Halle, special commissioner of the German admiralty, who made a tour of the ship yards of the United States, including those of the American Ship Building Co. (consolidated lake yards), has returned to Berlin and formulated his report. Dealing with the American yards he asserts that they acknowledge no masters.

"The ship works of the United States," he says, "are incomparably equipped for thorough, rapid, economical production, due primarily to the splendid transportation arrangements in the yard areas and the employment of the most improved type of cranes and pneumatic tools. With the enormous expansion of the industry at every important lake and ocean point the time is not far distant when America will join Germany in occupying, in relation to the world's vessel supply, the position of supremacy so long held by England. Germany's shipping needs are in excess of her own productive abilities. Heretofore they have been supplied exclusively by English builders, but probably we shall shortly go to the United States to supply the deficiency that exists. America's only scarcity is in native designing engineering talent. That this condition is both actual and urgent is gathered from the fact that Professors Elgar and Biles, the consulting engineers of the two largest ship works on the Atlantic coast, are English importations. Nevertheless, America is able today to build good ships. The new Camden, N. J., yards, like the new Krupp works at Kiel, are backed by unlimited capital, and are destined to be the model of the establishments of the world.

"America's strongest advantage over England is her freedom from the tyranny of the British workmen, whose mistaken hostility to modern practices may eventually crowd John Bull out of the struggle. The dock yards of the realm are obsolete. As yacht builders the Americans hold the preeminence, as the Kaiser lately took occasion to say. The ocean speed laurels are not unlikely soon to be wrested from Germany. The friendly rivalry of the Hamburg-American and German Lloyd firms insures us the premiership at least until the champion German figures are equalled."

VESSELS BUILT DURING AUGUST.

The bureau of navigation, treasury department, reports that 142 vessels of 32,210 gross tons were built in the United States and officially numbered during August. Among them were the lake-built vessels Colonial of 3,879 gross tons and the George W. Peavey of 4,997 gross tons. The largest steel steamer launched on the coast was the Morgan liner El Dia of 4,613 gross tons, built at Newport News. Following is the summary:

	WOOD.				STEEL.				TOTAL.	
	SAIL.		STEAM.		SAIL.		STEAM.			
	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.
Atlantic and gulf	66	10,941	18	1,437	1	235	2	4,839	87	17,452
Pacific	4	1,627	7	1,158	----	----	----	----	11	2,785
Great lakes	----	----	26	1,126	----	----	6	3,426	32	10,552
Western rivers	----	----	12	1,421	----	----	----	----	12	1,421
Total	70	12,568	63	5,142	1	235	8	14,265	142	32,210

IRON ORE MOVEMENT—LAKE FREIGHTS.

With the first of September iron ore shippers have finally equalled in round numbers the output up to the same date a year ago. On Sept. 1 a year ago the shipments aggregated 12,366,022 gross tons. Figures from one shipping dock are missing at this writing, but the information at hand shows conclusively that the shipments to Sept. 1 of this year are within about 100,000 tons of the total for last year just noted. The movement during August was not equal to the July movement, but very much in excess of August a year ago. Ore shippers are still taking all the vessel capacity that is offered to them at rates the same as were paid on the first cargoes moved last spring (80 cents from the head of Lake Superior, 70 cents from Marquette and 60 cents from Escanaba), as they realize that there is little hope of relief from delays to vessels unloading at Lake Erie ports and they are still anxious to move their ore to the limit of dock and railway capacity in advance of October and November grain shipments. Everything still points to a grain movement from the head of the lakes sufficient to cause some advance in freights later on, as Duluth grain shippers are now offering 2¼ cents to Buffalo for next week's loading, and the shortage in coal shipments, both anthracite and bituminous, is such as to require ship capacity for all the coal that the railroads can haul to Lake Erie ports up to the close of the season.

PROGRESS OF WORK AT NEWPORT NEWS.

[Special correspondence to the Marine Review.]

Newport News, Va., Sept. 4.—Work on the two new armored cruisers, Maryland and West Virginia, was begun at the ship yard here last Saturday. All of the drawings for the ships were completed some days ago and the work has been laid out. Now the frames are being bent and preparations made for putting down the keels. This work will progress simultaneously on both ships and it is expected that the frames will be ready to make a start on the keels in about a week. It is expected that the keel of the first-class battleship Virginia would go down ahead of the other warships recently contracted for, but a start has been delayed somewhat by a lack of material. The drawings were completed some time ago. It is believed, however, that the keel will be started in the next month. After Virginia, the large protected cruiser Charleston will be the next ship to take shape on the ways. The Newport News company will bid on the new warships for which proposals will be opened in Washington the latter part of this year..

The cruiser San Francisco, which has been reconstructed at the navy yard at Norfolk, will hardly go into commission Oct. 1, as originally planned. Guns for the ship have just arrived at the yard from the Washington gun foundry and to place these and put on the finishing touches will require probably two months. The main battery consists of twelve 6-in. guns, each weighing 11,000 lbs. When the San Francisco went out of commission in Hampton Roads after the Spanish-American war, she was taken to the navy yard and stripped with a view of reconstruction. Her guns were sent to the Washington gun foundry, where they were converted from the ancient slow-firing type to the most modern pattern. They were stored there until the commandant at the navy yard notified the department that the ship was ready for them, and several days ago they commenced to arrive at the yard and will be remounted at once.

The navy department has assigned to the new battleship Illinois most of the officers who will join the ship when she is commissioned at the ship yard this month. In addition to Capt. G. A. Converse, to command, Lieut. Com'dr R. N. Usher, executive officer, and Lieut. Com'dr Richard Henderson, navigating officer, the following have been assigned to the Illinois: Lieut. L. A. Kaiser from the ship yard; Lieuts. O. P. Jackson and J. V. Klemann from the Vermont; Lieut. W. R. M. Field from the naval academy; Lieut. H. E. Parmenter from the bureau of equipment, and Naval Cadets S. M. Henry and L. B. McBride. Other officers will be assigned this week and the complement will be complete by Sept. 10, when it is expected that the ship will be commissioned.

It is stated that the Morgan liner El Alba will not be launched under thirty days. It has not been determined whether or not the Pacific Mail liner Siberia will be launched before or after El Alba.

The former Spanish gunboat Sandoval and the torpedo boat Manley arrived at the navy yard this week from Annapolis and are now in the dry dock being overhauled. The United States collier Ajax, which has been overhauled at the navy yard, is nearly ready to leave and will shortly sail for Manila with about 8,000 tons of coal.

John R. Sherwood, vice-president and general manager of the Old Bay Line of steamers between Norfolk, Old Point and Baltimore, came down from Baltimore several days ago and went up to Richmond, where he consulted the officers of the Wm. R. Trigg Co. relative to the building of a new steamer for the Chesapeake bay service. Although no contract has been awarded yet it is understood that the Trigg yard will build the new boat, which will be the queen of the line, larger and more elegant than the Alabama, which is now the Old Bay Line's finest boat.

Capt. Watley of the British steamer Manchuria, which arrived in Hampton Roads from Europe, reported having passed almost in mid-ocean the little yawl, only 30 ft. in length, in which Capt. Andrews of Boston and his bride started for a trip across the ocean. Capt. Andrews signalled "all well" to the Manchuria, which stopped at sea in order to let Capt. Watley satisfy himself that the two sole occupants of the little craft needed no assistance. Capt. Andrews was married in Boston several weeks ago and he decided to take his bride across the ocean in a 30-footer. When sighted by the Manchuria, the yawl was headed homeward and it may be that the bride and groom have already had enough of their ocean trip.

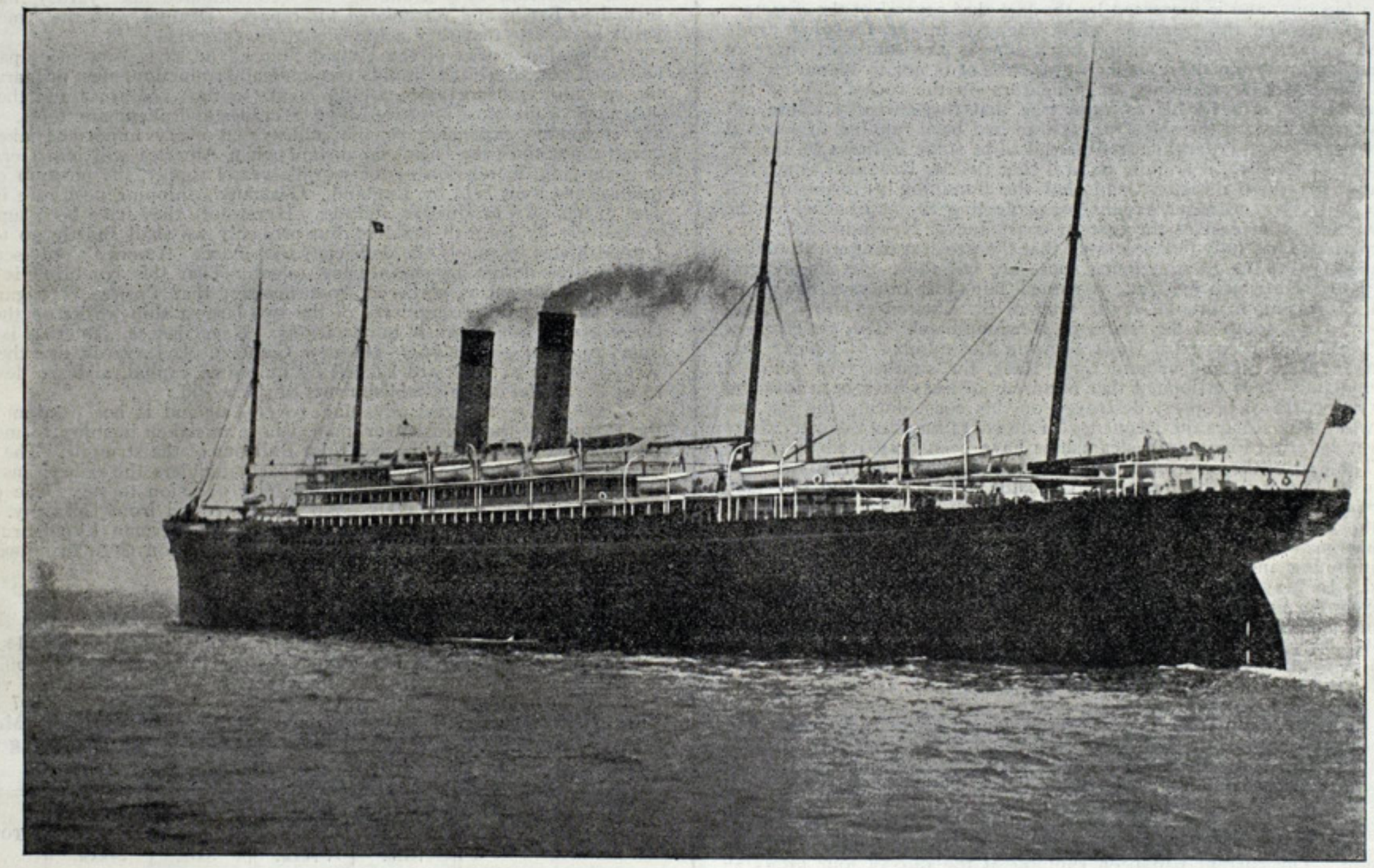
OUR TRADE WITH SPAIN.

Trade relations between the United States and Spain have resumed the conditions existing prior to the war between the two countries. The exports from the United States to Spain in the fiscal year just ended were larger than in any preceding year with a single exception, 1883, and show an increase of $6,000,000 over 1899; while our imports from Spain also show a marked increase over 1899. In the seven months ending with July, 1901, our imports from Spain were $3,110,718, against $2,875,840 in the corresponding period of the preceding year, while during the same period our exports to Spain increased from $8,189,288 to $8,988,970. For the single month of July our imports increased from $270,216 to $634,665, and our exports to Spain increased from $640,689 to $1,156,490.

Raw materials form the most important feature of our exports to Spain, and fruits and iron ore the principal articles of importation. The total value of our imports from Spain in the fiscal year 1901 was $5,409,-301, and in 1900 $5,950,047. The details of the 1901 importations are not available, but those of the year 1900 show: Fruits, over $1,500,000; nuts, $518,000; wines, $538,000, and iron ore, $650,000 in value. Turning to the export side, raw materials prove to be the chief feature of our export trade with Spain. Our total exports to Spain in the fiscal year 1901 were $15,484,738, against $13,399,680 in 1900. Of the latter total, cotton was valued at $9,618,930; mineral oil, $883,011; shooks and staves, $850,295; tobacco, $661,842; boards and planks, $426,387; breadstuffs, $236,353; iron and steel manufactures, $162,738; chemicals, drugs, etc., $36,582; and meat products, $18,470. While the figures of the year just ended are not yet available as to details, it is probable that the chief growth will be found to be in the item of cotton, of which prices during the year were materially higher than in 1900, whose figures are above quoted.

The Deutschland has again broken her own record on the westward route. This trip was made from Cherbourg mole to the Sandy Hook lightship in 5 days, 12 hours and 23 minutes, a distance of 3,045 miles at an average speed of 23 knots per hour.

The Largest Vessel in the World.



THE CELTIC OF THE WHITE STAR LINE.

Length, 700 ft.; breadth, 75 ft.; depth, 49 ft.; registered tonnage, 20,880 tons; load displacement, 37,700 tons. Built by Harland & Wolff, Belfast, Ireland.

DELAWARE RIVER SHIP BUILDING.

WHAT IS DOING AT THE WORKS OF THE CRAMPS, NEAFIE & LEVY, NEW YORK COMPANY'S PLANT AND OTHER LARGE ESTABLISHMENTS—HIGHER SCHEDULE OF WAGES PROPOSED BY ENGINEERS.

[Special correspondence to the Marine Review.]

Philadelphia, Sept. 4.—The torpedo boat destroyer Bainbridge, which was successfully launched from Neafie & Levy's ship yard Tuesday, will have her speed trial before the end of the present week. The machinists are now engaged in perfecting the working of the steam steering gear and the boat is undergoing daily dock trials of her engines and boilers. The Bainbridge will be tried over the measured course at the head of Delaware bay. Her contract speed is 29 knots but it is thought that the recent alterations in her stern lines will add another knot at least.

In addition to the five vessels of war under way at this yard—torpedo boat destroyers Bainbridge, Barry and Chauncey and the cruisers Denver and St. Louis—the Neafie & Levy company is unusually busy with several vessels for private companies. The steam pilot boat Texas for the Galveston pilots will be finished in about three weeks' time. She is 112 ft. long, and will, in her arrangements, be one of the best vessels of her class afloat. The large seagoing tug Vigilant, built for the Atlantic Towing Co. of Brunswick, Ga., will be ready in two weeks and the seagoing tug Anna W., built for the National Dredging Co., and to go to Mobile, will be turned out about the same time. The company is also about to lay the keel of a passenger and freight steamer for the Weems line of Baltimore. She will be 200 ft. long, 41 ft. beam, and will be of 13 knots speed. Among the repair jobs which are on hand at this yard, the biggest will be that of the steamship City of Trenton, whose port boiler exploded August 28 in the Delaware river, off the northern part of the city. A full survey has not been made as yet but it is known that the damage is quite extensive, easily reaching $30,000. The steam pilot boat Philadelphia, which was damaged in collision off the Delaware capes with the Norwegian steamship Ansgar, will return to service on Saturday.

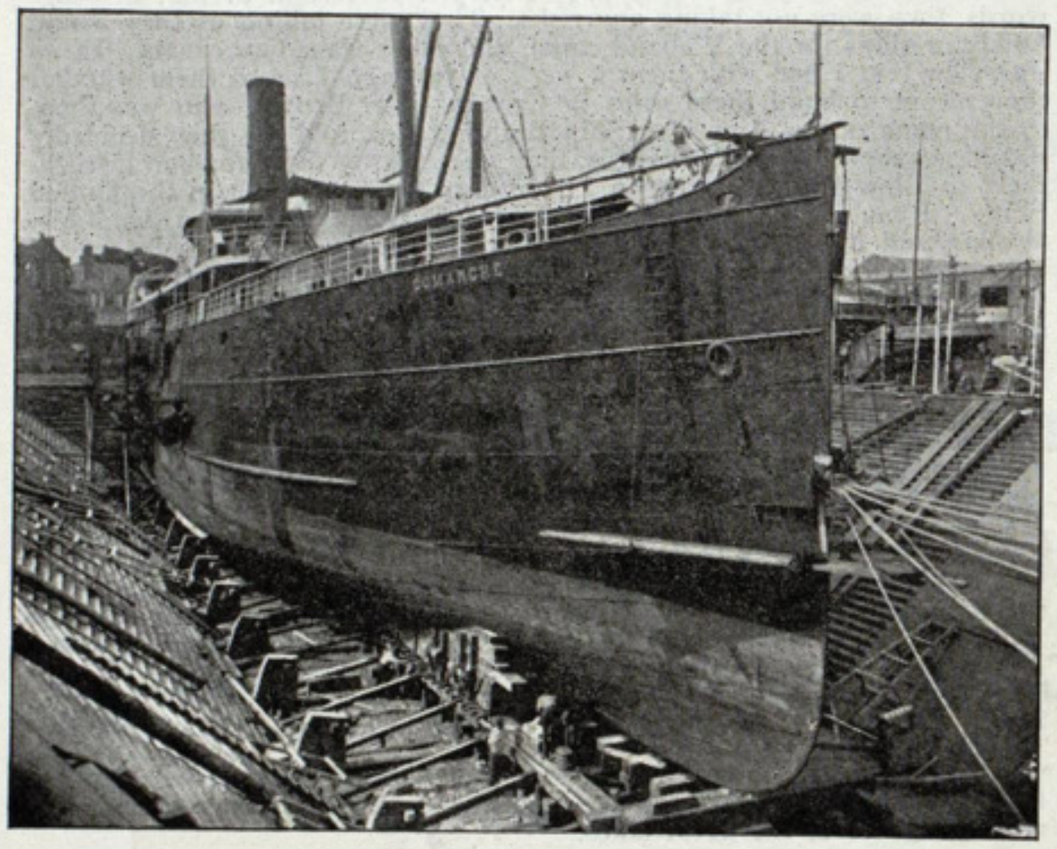
A contract has been made by Baron Ferzon, Russian naval attache at Washington, with the Lidgerwood-Miller Marine Cableway Co. for the installation of its system for coaling at sea, on the battleship Retvizan, which is now nearing completion at Cramps' ship yard. While experiments are to be made with this system in the English navy, the Russian, it is stated by one of the Retvizan's officers, is the first foreign navy to adopt it for one of its battleships. Preparations are complete for the Retvizan's trial trip to begin Sept. 11. Gen. George A. Brynk of the Russian navy has arrived in Philadelphia accompanied by his aid, Capt. Moeller. He will make the structural tests in connection with the warship.

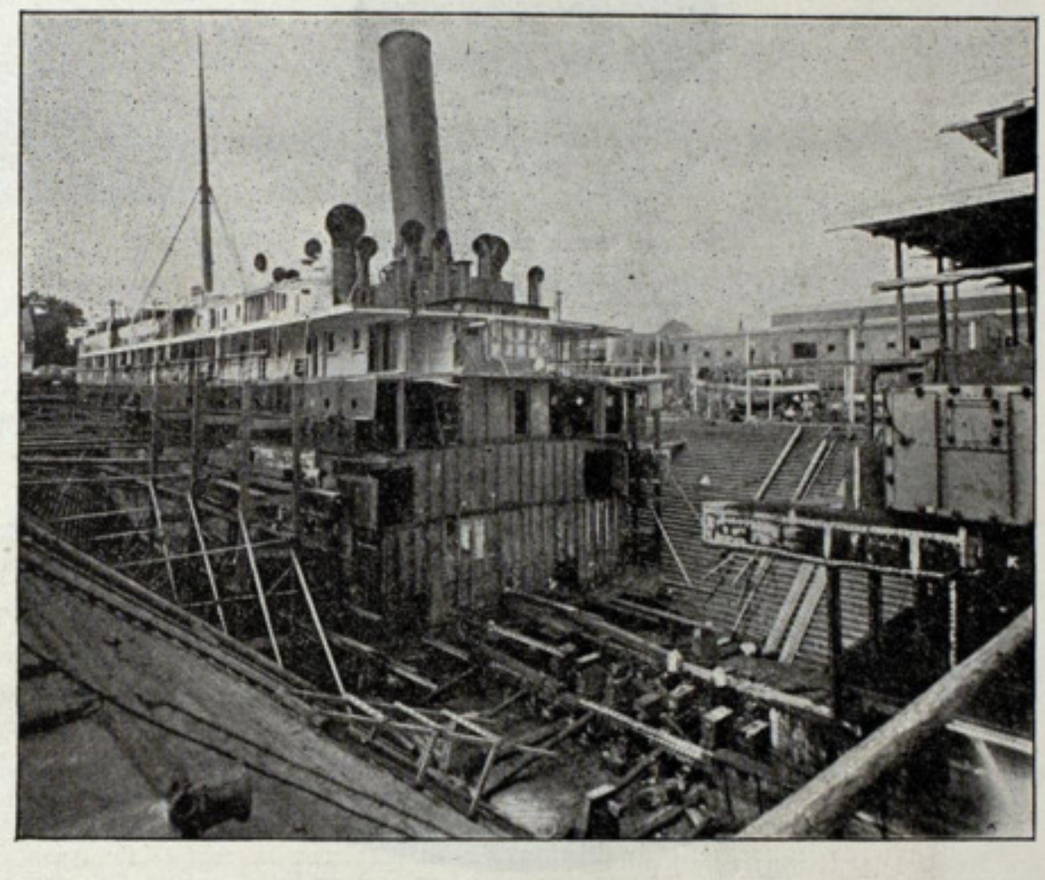
The New York Ship Building Co. of Camden has now well under way three of the ships included in the important contract it has on hand. In all the company has 124,915 tons under contract and of this amount ships that will aggregate 32,565 tons are already started. One of the Atlantic Transport ships of 16,945 tons will shortly be laid down. Three of the ships are for the American-Hawaiian Steamship Co. and these are the ones now under construction. One 8,200-ton ship will be launched next month, another of the same size in October and a 16,165-ton ship for the same line several months later. Three ships are to be built for the Atlantic Transport Co., one of 23,530 tons and two of 16,945 tons each. The company has now well along the work of converting the steamship M. S. Dollar into a tanker for the Guffey Petroleum Co. She is to be rechristened J. M. Guffey. This ship, which is the first constructed by the company, was launched May 4.

Believing that the duties and responsibilities of a marine engineer warrant an increase of pay, the Marine Engineers Beneficial Association, No. 13, of this city, has prepared a new scale of wages, classification and crew list. It will take effect Oct. 1. Steamers in Central American, South American and West Indies trades, as well as all steamers bound to Pacific ports are divided into two classes, those of 2,500 tons and over in the first class and those of 1,200 to 2,500 tons in the second class. All must carry three assistant engineers. Wages in the first class are: Chief, $150 a month; first assistant, $90; second, $80; third, $70. In the second class the chief is to be paid $135; first assistant, $80; second assistant, $70; third assistant, $60. Coastwise—First class steamers, 2,500 tons and over; second class steamers, over 1,200 and under 2,500 tons; third class steamers, 1,200 tons and under. Wages in the first class are $150 for the chief; first assistant, $90; second assistant, $80; third assistant, $70; second class, chief, $135; first assistant, $80; second assistant, $70; third assistant, $60; third class, chief, $115; first assistant, $70; second assistant, $60. All steamers in the coastwise trade on runs exceeding twenty-four hours are to carry three assistant engineers, and steamers on runs of less than twenty-four hours to carry two assistant engineers. Tons are to be in all cases gross tons.

The American Line steamship New York, which for several months has been undergoing extensive repairs at Cramps' ship yard, started for New York last Saturday in tow of three Red Star line tugs. Much work yet remains to be performed on the vessel but a stage had been reached where dry docking was necessary and there is no dock in this vicinity large enough to accommodate the bulk of the mammoth craft. The work of painting and scraping will be done in the Erie Basin, after which the New York will be towed back here for her finishing touches.

The Comanche of the Clyde Line undergoing lengthening.





The Neafie & Levy Ship & Engine Building Co., Philadelphia, Pa., lengthened this vessel 48 ft. recently.

MANCHESTER SHIP-CANAL REPORT.

If a profit for shareholders is regarded as the primary consideration in connection with the Manchester ship-canal the report presented at the last yearly meeting of the company last week is not inspiring. An increase of £5,162 in the revenue is not sufficient to encourage the hope that the income of the concern will ever reach the sum of £750,000 per annum, estimated in 1884 by the provisional committee which examined the scheme. Moreover, it cannot be overlooked that the capital is now £15,000,000, instead of £10,000,000 apart from the accumulated interest owing to the Manchester corporation. Other considerations have, however, to be taken into account. The vital element in the agitation which brought about the construction of the waterway was the necessity for cheaper transport between Manchester and Liverpool. The prosperity of that district, and largely of the Lancashire cotton industry, was held to depend upon cheap freights. The example of other nations, and especially of Germany and the United States, proves that the promoters of the waterway were far-seeing in their conclusions. They hoped to divert 3,000,000 tons of traffic to the ship-canal, and here at least their hopes are within measureable distance of realization, for the weight of toll-paying merchandise in the last half year was 1,391,149 tons.

NEW TYPE OF SUBMARINE BOATS.

The Lake Submarine Torpedo Boat Co., capitalized at $1,000,000 and using the patents of Simon Lake of Bridgeport, Conn., has decided to establish a ship yard and machine shop at Bridgeport for the building of submarine torpedo boats. While the plant is being established the Pacific Iron Works will build a boat for the company, which will be used in demonstrating the value of the type to the naval bureau of construction at Washington. The company asserts that it has the only perfect submarine in existence and that it will discount the Holland boat. It has secured patents in all civilized countries. Recently its submarine Argonaut, which was built for commercial purposes, was examined by representatives of the British and Dutch navies, who expressed satisfaction with it. One feature which is peculiar to the Lake type is a door in the bottom of the craft which allows the egress of divers to work at mining and countermining in harbor operations.

The secretary of the navy has ordered that the repairing of all ships shall hereafter be done under the bureau of construction and repair instead of being divided among the several bureaus as at present, which has led to considerable confusion.

GEN. WM. LUDLOW.

Gen. Wm. Ludlow, United States army, a gallant soldier and veteran of two wars, who died at the home of his son-in-law, C. A. Griscomb, Jr., in Morristown, N. J., on Friday last, was well known to the shipping interests of the United States on account of his connection as an army engineer with river and harbor works and with the United States light-house institution. He was especially well known in Philadelphia, in New York and on the great lakes, where he was in charge of important government works. Vessel owners of the lakes will remember his controversy with the light-house board over the lighting of the St. Mary's river and the support that was given him on account of the ability and energy that attended everything he undertook. Gen. Ludlow's death was unexpected. The sickness from which he died was consumption, which he contracted while military governor of Havana, Cuba. When he reached Morristown five weeks ago after being invalided home from the Philippines he was dangerously ill. He soon rallied and spent the pleasant days outdoors, but a hemorrhage on Friday morning was followed by death within a couple of hours. He is survived by a widow; one daughter, Mrs. C. A. Griscom, Jr.; two brothers, Admiral Ludlow, United States navy, retired, and Edward Ludlow of Mexico; and one sister, Mrs. Robert Bond of the Indian Territory.

Gen. William Ludlow was born at Islip, Long Island, N. Y., Nov. 27, 1843, the son of William Handy Ludlow, who was a major general in the civil war. He was graduated from West Point in June, 1864, and was appointed first lieutenant of engineers. Exactly nine months later he was brevetted lieutenant colonel for gallantry in action. Young Ludlow's

GEN. WM. LUDLOW.

first duty in the civil war was as chief engineer of the twentieth army corps. He went through the campaign in Georgia and was brevetted captain for gallantry at the defense of Altoona Pass. He participated in the siege of Atlanta and was in charge of the construction of the defenses of Rome, Ga. He was brevetted major on Dec. 21, 1864, and on March 13, 1865, was brevetted lieutenant colonel for "gallant and meritorious conduct in the campaign of the Carolinas." From March 20 to April 26, 1865, he was assistant chief engineer to General Sherman's army on the "march to the sea."

After the close of the civil war he was engaged in engineering work at various army posts in the east and west, and in river and harbor work at New York and on Delaware bay until 1882, when he was given three years' leave of absence without pay, to hold the position of chief engineer of the Philadelphia water department. From April, 1886, to January, 1888, he was engineer commissioner for the District of Columbia, where he gained experience which was of great value to him later as governor of Havana. For several years following 1888 he was in charge of river and harbor improvements and was engaged in light-house engineering work on the great lakes. Later he was military attache to the London embassy. Then he was sent to Nicaragua to report on the feasibility of the Nicaraguan canal, and his report, which was made in 1895, added largely to his reputation as an engineer.

Ludlow was in charge of fortifications at New York in 1898, when he was appointed brigadier general of volunteers and sent to Cuba with General Shafter. In the attack on Santiago he was in command of the first brigade of General Lawton's division, and at El Caney distinguished himself by personal bravery to an extent which caused General Lawton to say of him in an official report: " . . . his assignment to command a brigade in my division I consider a high compliment to myself. In this battle General Ludlow proved himself a capable and able commander; his coolness, good judgment, and prompt action in difficult situations were remarkable. To this and his personal example on the firing line was due the decisive success of the attack on that part of the line. I recommend General Ludlow for substantial recognition."

General Ludlow led in the charge on El Caney. His white sailor hat made him a conspicuous target. He was advised to change it for some other headgear, but paid little attention to this and similar suggestions. He was at the head of his men from start to finish, and eye witnesses of the fighting in which he participated declared him one of the bravest officers the United States army had ever known.

On Sept. 1, 1898, President McKinley appointed him major general of volunteers and assigned him to command the second division of the first army corps. In December, 1898, he was appointed military governor of Havana.

WOLVIN PROPOSAL REJECTED.

Mr. J. Israel Tarte, minister of public works for the Dominion of Canada, has rejected the Wolvin proposal to supply for St. Lawrence river navigation a fleet of steamers, together with elevators and warehouses at Port Colborne, and to acquire elevator facilities at Montreal. The news of the rejection caused a great stir in Montreal when it became known, but no definite information could be obtained there further than the meager dispatch from Ottawa that the minister had decided not to recommend the Wolvin proposal to his colleagues. On Tuesday last, however, at the launching of the steam dredge, bearing the name of the minister, at the Polson Iron Works, Toronto, Mr. Tarte in a speech gave his reasons for rejecting the offer of the Wolvin syndicate. The part of the speech dealing with the rejection is as follows:

"My own ambition since I have been in office, and even before I was in office, has been to improve our waterways; has been to work in such a direction that Canadian trade should flow through Canadian channels. I was animated by that line of thought when a few days ago I decided not to advise my colleagues to adopt what is known as the Wolvin proposal in connection with Montreal harbor. What are these gentlemen asking? They were asking us, first, for a site at Port Colborne, for the use of a pier at Port Colborne—well, such a pier as would cost $500,000; they were asking the privilege of erecting an elevator on that pier, but at the same time they were asking that the government of the country would bind themselves to buy back that pier in certain events; in other words, they were not taking any risks. They were telling us they would build ten ships for the Welland canal, and other Canadian canals. In an interview that I had with them a week or two ago I asked them whether they meant to build these ships in Canada. Mr. Brown, who was there in the name of the American Ship Building Co., told me they decidedly would not do so. In other words, they were asking the Canadian government to allow them to bring in free of duty ten boats built in the United States. I could not stand that, and they were asking more than that. Mr. Wolvin and his friends were asking us the use of the two sides of the Windmill basin free, without any rental, for twenty-five years, with the option of renewal for another twenty-five years. They were asking us to give them at least $400,000 and perhaps $500,000, to build an elevator on the north side. They undertook to pay 5 per cent. interest on the money that we were just lending them. They were asking at the same time that, on the completion of the south wall, we would undertake to lend them the money necessary to build another elevator and freight sheds, they again paying us 5 per cent. interest. In other words these American gentlemen were simply asking us to loan them money at 5 per cent. to build elevators and to build warehouses in the port of Montreal, and to give them the use of a basin, a magnificent basin, that will cost $1,000,000 when it is completed. I could not stand that. I made up my mind that there is enough enterprise, that there is enough money in Canada to allow us to keep cool and wait until the Canadian money and enterprise would do for us what these Americans were offering to do."

AROUND THE GREAT LAKES.

Capt. John H. Blend, for several years harbor master and superintendent of bridges in Milwaukee, died Wednesday. He was well known as a navigator of the great lakes.

Hatch fasteners of the kind patented by Capt. M. Mulholland of the Bradley steamer Alva are to be applied to all six of the steel steamers which the American Ship Building Co. has under construction for steamship companies organized by Capt. W. W. Brown of Cleveland.

Capt. Lewis Stone of Vermillion, who has been on the steamer John W. Gates with Capt. Ralph Lyons all summer, has been assigned to command of the steamer Geo. A. Peavey, one of the large freighters just completed at the Lorain works of the American Ship Building Co. for the Peavey Steamship Co. of Duluth.

The Canadian minister of marine and fisheries has notified Capt. George P. McKay of the Lake Carriers' Association that as soon as the government obtains permission from property owners the trees which now obscure the light on Middle island, Lake Erie, will be cut down. The government communicated with the property owners some time ago but received no word from them. A further communication has been sent to them.

Col. G. J. Lydecker, United States engineer at Detroit, has just awarded three contracts for Hay Lake channel improvements (St. Mary's river) that involve an expenditure of $500,000. The channel will be widened from the upper end down the river for a distance of 21,000 ft., and the total amount of excavation reaches 2,742,250 cubic yards. The work is in three sections, the first being hardpan and gravel; the second in clay and gravel, and the third in sand, clay and gravel. Hickler Bros. of Sault Ste. Marie secured the first contract, with a bid of 56 cents per cubic yard, which means for them a job worth $155,456. S. O. Dixon of Milwaukee took the second section, on a bid of 11.4 cents, making the contract worth $175,340. Hingston & Woods got the last section at 15⅜ cents, making the contract worth $142,434. The work must be done in two years. When completed a channel will be sufficiently wide to prevent a recurrence of the Douglass Houghton trouble of two years ago.

A delegation from the canal association of Buffalo has just had a conference with a committee of the canal association of greater New York and they have jointly decided to do all in their power to advance the project of a 1,000-ton barge canal. A sub-committee of the canal association was directed to co-operate with a like committee of the Buffalo Merchant's Exchange on such a plan of campaign as they may agree upon to procure the adoption of the necessary legislation.

HARBOR OF MEAFORD, ONT., OPENED.

The steamer Spokane of the Wilson line, Cleveland, has been chartered for the season by the Port Huron and Duluth line and opened the port of Meaford, Ont., last week with a cargo of 155,000 bushels of grain. As the port is entirely new, Mr. William A. Williams, the master of the Spokane, has sent the following description of it to the Review which will doubtless be of interest to vessel men:

"The town of Meaford is situated at south end of Georgian bay about 7½ miles south of Cape Rich. The shore from Cape Rich to Meaford can be approached with safety to a distance of half a mile.

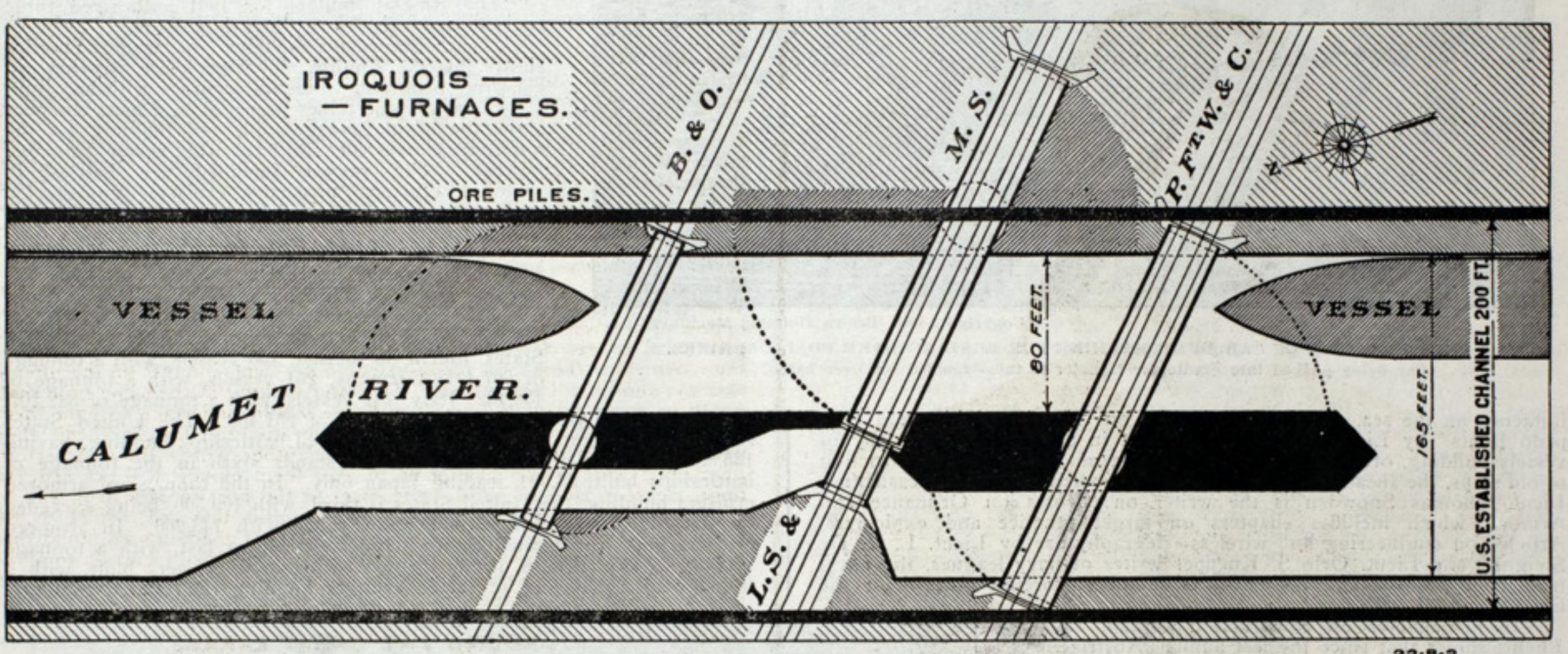
"The harbor of Meaford is formed at the mouth of a small stream known as the Big Head river. At present there is a breakwater on the east side projecting out into the lake about N. x W. 750 ft. On the west side is a pier about 500 ft. long with east breakwater and west pier to form a protection from the lake. There is a harbor enclosure about 1,450 ft. long and varying in width from 140 to 700 ft. at its widest part. There is an arm extending from west pier to the breakwater within a distance of about 150 ft., forming the entrance. At the present time a channel 150 ft. wide and 22 ft. deep is dredged from the harbor entrance up to the elevator. The improvements to be made and which are going ahead rapidly are as follows: To extend the east breakwater out into the lake 600 ft. curving it more to the west so as to protect the harbor entrance; also taking off 150 ft. of the arm at the west pier so as to give a wide entrance of about 250 ft. to the harbor. The whole area enclosed is to be dredged to a depth of 22 ft. The bottom is hard clay and will carry seven fathoms of water within 1,000 ft. of the harbor entrance. The elevator, owned by The Meaford Elevator Co., has a capacity of 750,000 bushels. It is a new house and first class in every respect. The Spokane opened the port Monday, Aug. 26, drawing 17 ft. 6 in. water and had no difficulty in going right up to the elevator dock."

OBSTRUCTIONS AT SOUTH CHICAGO.

The plat herewith graphically illustrates artificial obstructions to navigation in the Calumet river at South Chicago, concerning which vessel owners are now protesting. The main lines of the B. & O., the L. S. & M. S. and the P., F. W. & C. railroads cross the channel about 3,000 ft. from the mouth of the river. Frequent controversies have arisen between the B. & O. railroad and the captains of vessels moored at the docks of the Iroquois Furnace Co., as it is necessary, as shown by the plat, to move the vessel whenever it is desired to swing the bridge. The plat also shows that only one 80-ft. channel is available for navigation, the channel on the other side of the swing protection piers being unavailable.

The United States government has established the width of channel for the Calumet river at 200 ft., and this width has already been obtained, with the exception of this locality, for a distance of about three miles. Vessel owners and captains who are compelled to use the Calumet river have filed protests against these artificial obstructions with the local government engineers and with the secretary of war, and it is to be hoped that prompt action will be taken by the United States government authorities.

These artificial obstructions could be obviated by removing the center pier swing bridges and replacing them with three bascule bridges, side by side, such as have been and are now being built at Cleveland, New York, Boston, Chicago and other places in the United States. Such bridges would give a free and unobstructed channel of full width, in place of the present narrow, difficult and dangerous channel.



Plat showing obstructive character of three adjacent swing bridges carrying the main lines of the B. & O., the L. S. & M. S. and the P. F. W. & C. railroads across the Calumet river at South Chicago.

The Collingwood Ship Building Co., Collingwood, Ont., is going to make a gala occasion out of the launching of the Huronic, the first steel steamer to be constructed in the Dominion. The Huronic will be launched at 1 p. m., Sept. 12, and a special train will convey the guests to Collingwood from Toronto. The Huronic is a passenger and freight steamer of 3,200 tons capacity and is being built for the North West Transportation Co., Ltd. Immediately after the launch the keel of a 7,000-ton steel tow barge for the Clergue interests will be laid.

PACIFIC COAST SHIP BUILDING DELAYED.

That the strike of the machinists is seriously interfering with the ship builders of the Pacific coast is evidenced by the following dispatch from Tacoma:

Four contracts in which Tacoma firms are interested and which were to have been let several weeks ago have been delayed by the strike conditions, and it is not probable that the ship builders will be allowed to begin work until the trouble is ended. Vessels that are building have not been interfered with, unless they were far enough along to be ready to take on machinery. In that case they have been compelled to lie at the docks, awaiting either a settlement of the strike or until such time as some of the shops are able to provide the machinery. The decision of ship owners to hold up construction work until the strikes are settled is due partially to the fact that the ship owners are not confident they would be able to use the boats if they were built. The fact that steamers could not be completed under the present conditions naturally delays such contracts. The ships now in commission are loaded with the greatest difficulty at San Francisco, and conditions are not favorable. Most of the ship owners who are ordering new boats live at San Francisco and are governed in their action largely by the conditions in that port.

But two vessels are being built in Tacoma at present. Both of these are on the ways at the Tacoma Ship Building Co.'s plant, near the Puyallup river. The steam schooner being constructed for E. J. Dodge will probably be launched first, and will be finished shortly after the second boat slips from the ways. The schooner will be 165 ft. over all and have a gross tonnage of 1,000. It is expected the boat will be launched during the latter part of September, and will be finished about Oct. 15. Workmen are now ceiling the new craft. The barkentine being built for Charles Nelson will be 235 ft. over all and have a gross tonnage of 1,500. The ship building company is now planking and ceiling the vessel. She will probably be launched about the middle of October and completed by Dec. 1.

CARGO RECORDS—LAKE FREIGHT STEAMERS.

The steamer Wm. Edenborn, owned by the United States Steel Corporation, and which is one of four vessels that are the largest on the great lakes, has again broken her own record and delivered at Conneaut from Lake Superior, the largest cargo ever moved in a lake freighter. The ship was paid for carrying 7,380 gross tons of iron but the actual weight was 7,454 gross tons as all vessels in the ore trade carry 1 per cent. more ore than they are paid for—an allowance made on account of moisture. The number of net tons (2,000 lbs.) in the cargo was 8,348. Corrected cargo records to date are as follows:

Iron ore—Steamer Wm. Edenborn, owned by Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,454 gross or 8,348 net tons, Two Harbors to Conneaut; tow barge John Smeaton, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,446 gross or 8,339 net tons, Duluth to Cleveland, draught of 18 ft. 1 in.

Grain—Steamer Simon J. Murphy, Eddy Bros. of Bay City, 269,000 bushels of corn, equal to 7,532 net tons, South Chicago to Buffalo; Steamer Douglas Houghton, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 308,000 bushels of clipped oats and 60,000 bushels of corn, equal to 7,520 net tons, Manitowoc to Buffalo.

Coal—Steamer I. L. Elwood, owned by Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,688 net tons anthracite, Buffalo to Duluth; Steamer I. L. Elwood, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,388 net tons of bituminous, Cleveland to Duluth.

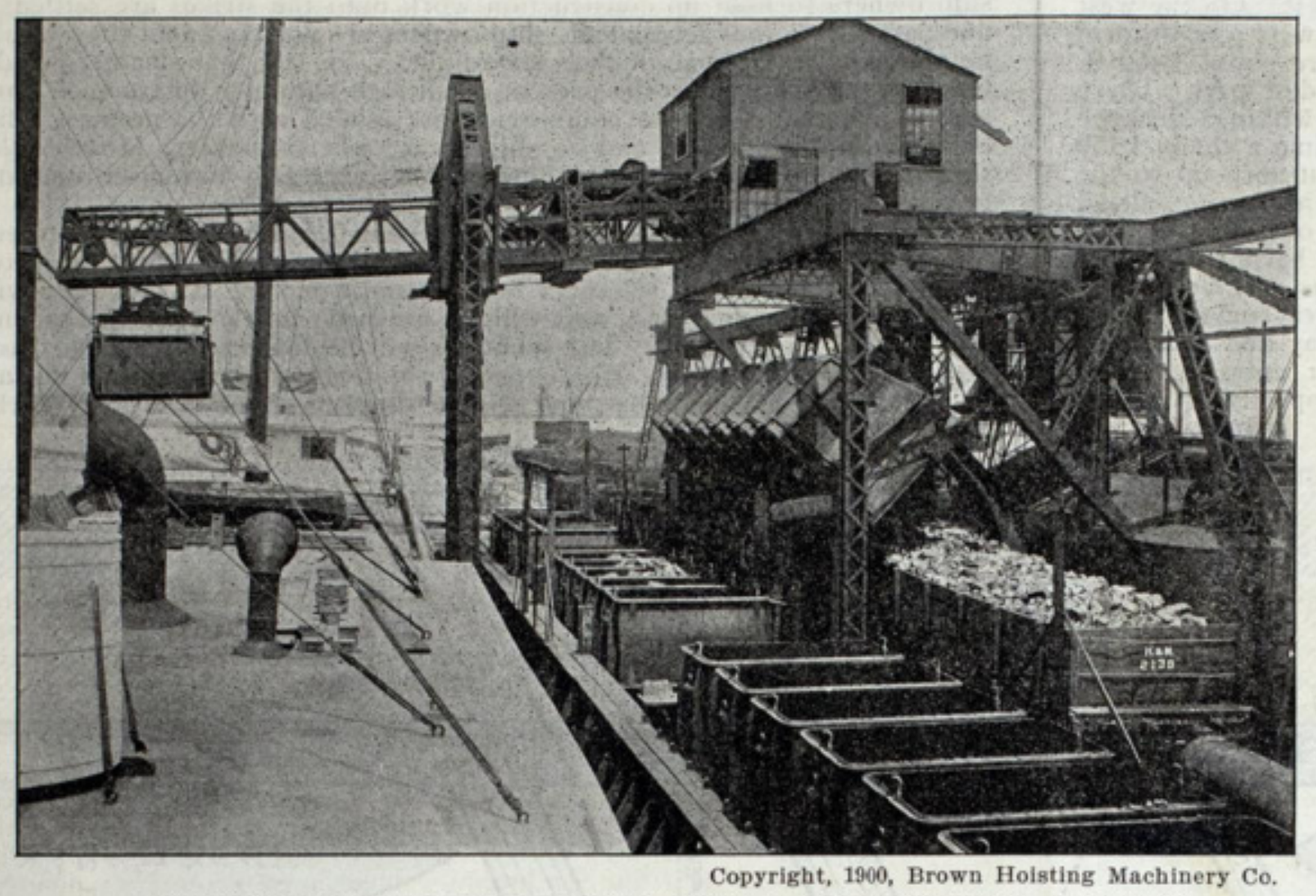
Ground was broken this week for the ship fitter's shop at the Charleston navy yard. The sum of $150,000 is now available for this purpose and $50,000 additional is to be appropriated. Contracts for ship fitters' and metal workers' shops were awarded together to L. L. Leach & Son of Chicago for $325,000.

Low Rate Excursion to New York via B. & O.—Tickets on sale daily until Oct. 20 with privilege of returning via Buffalo. Call at city ticket office, 241 Superior street. Oct. 20.

GROWTH OF NAVIES.

THE NAVAL INTELLIGENCE BUREAU ISSUES A COMPREHENSIVE REVIEW OF WHAT THE NAVIES OF THE WORLD ARE DOING.

"Notes on Naval Progress," the annual publication of the office of naval intelligence, just issued, is one of the most interesting that has ever been prepared. It deals with a variety of subjects relating to foreign navies and shows that Capt. Charles D. Sigsbee, the chief intelligence officer, and his assistants at Washington and abroad, have been alive to the value of what is being done by foreign countries to extend their influence on the sea. The seven chapters on "Notes on Ships and Torpedo Boats" by Lieut. Harry Phelps treat in a comprehensive way of vessels building, ordered and proposed, of steam trials, of reconstruction of old ships, the sheathing of ships, coaling records and marine casualties. Lieut. Thomas Snowden is the writer on "Notes on Ordnance and Armor," which includes chapters on target practice and explosives. Articles on engineering and wireless telegraphy are by Lieut. L. R. De Steigner, and Lieut. Orlo S. Knepper writes of navy leagues, the naval maneuvers of 1900 and the naval estimates of foreign powers for the fiscal year 1901-1902.



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BROWN TYPE OF CAR DUMP MACHINE FOR LOADING LAKE COAL CARRIERS.
Car being pushed into cradle for transfer to tubs—Loaded tub over hatch.

In his chapter on construction abroad, Lieut. Phelps shows that since the last annual, Austria has laid down one armored cruiser and launched one battleship and one cruiser of the third class; Denmark has laid down one third-class battleship and launched a torpedo transport; England has laid down two first-class battleships, seven armored cruisers, two second-class protected cruisers, two sloops and two shallow-draught gunboats, and has launched four first-class battleships, seven armored cruisers, three sloops, one shallow-draught gunboat, twelve torpedo boat destroyers and three torpedo boats; France has laid down three armored cruisers, six torpedo boat destroyers, eight submarine boats and four torpedo boats and has launched four armored cruisers, one despatch transport, four torpedo boat destroyers, eleven torpedo boats and four submarine boats; Germany has laid down one first-class battleship, one armored cruiser and one gunboat, and has launched three battleships of the first class, one armored cruiser, four protected cruisers of the third class, one gunboat and seven torpedo boat destroyers; Holland has laid down two third-class battleships and two torpedo boats and has launched one third-class battleship and three torpedo boats: Italy has launched one first-class battleship and six torpedo boat destroyers; Japan has launched one first-class battleship and two torpedo boats; Russia has laid down three first-class battleships, one coast defence ironclad, one protected cruiser of the first class and one of the second class, one training transport, and two torpedo boat destroyers, and launched four first-class battleships, two armored cruisers, two second-class protected cruisers, one gunboat and seven torpedo boat destroyers; Spain has launched one armored cruiser and Sweden has launched one coast defence ship.

In addition to the vessels already laid down, England has authorized and ordered ten torpedo boat destroyers, one torpedo boat, five submarine vessels and one repair ship. In the current fiscal year she will lay down three first-class battleships, six armored cruisers, two third-class protected cruisers, two sloops, ten torpedo boat destroyers, five torpedo boats and one distilling ship. France has authorized two first-class battleships, one armored cruiser, sixteen torpedo boat destroyers, four torpedo boats and eight submarine vessels. It is reported, also, that France is to build twenty submarine boats.

One of the most significant pieces of information in Lieut. Phelps' article is that the large increase in the German navy will have been made before 1906, the year originally set for the completion of the naval program. The last of the new vessels for the active battle fleet, he says, will be laid down in 1905, and after that year only one new battleship will be laid down, and that for the non-active fleet. "So that it will be seen," he adds, "that the proposed German battle fleet will be practically complete when the vessels laid down in 1905 shall be finished, the new cruisers laid down after 1905 being either for foreign service or the non-active fleet."

Owing to grave difficulties in the ministry of marine and to those experienced in securing the necessary appropriations, the building of new battleships by Italy has been practically at a standstill, but Lieut. Phelps says that these difficulties are believed to have been surmounted. In June, 1900, it was practically decided to lay down four ships of medium type between battleships and armored cruisers.

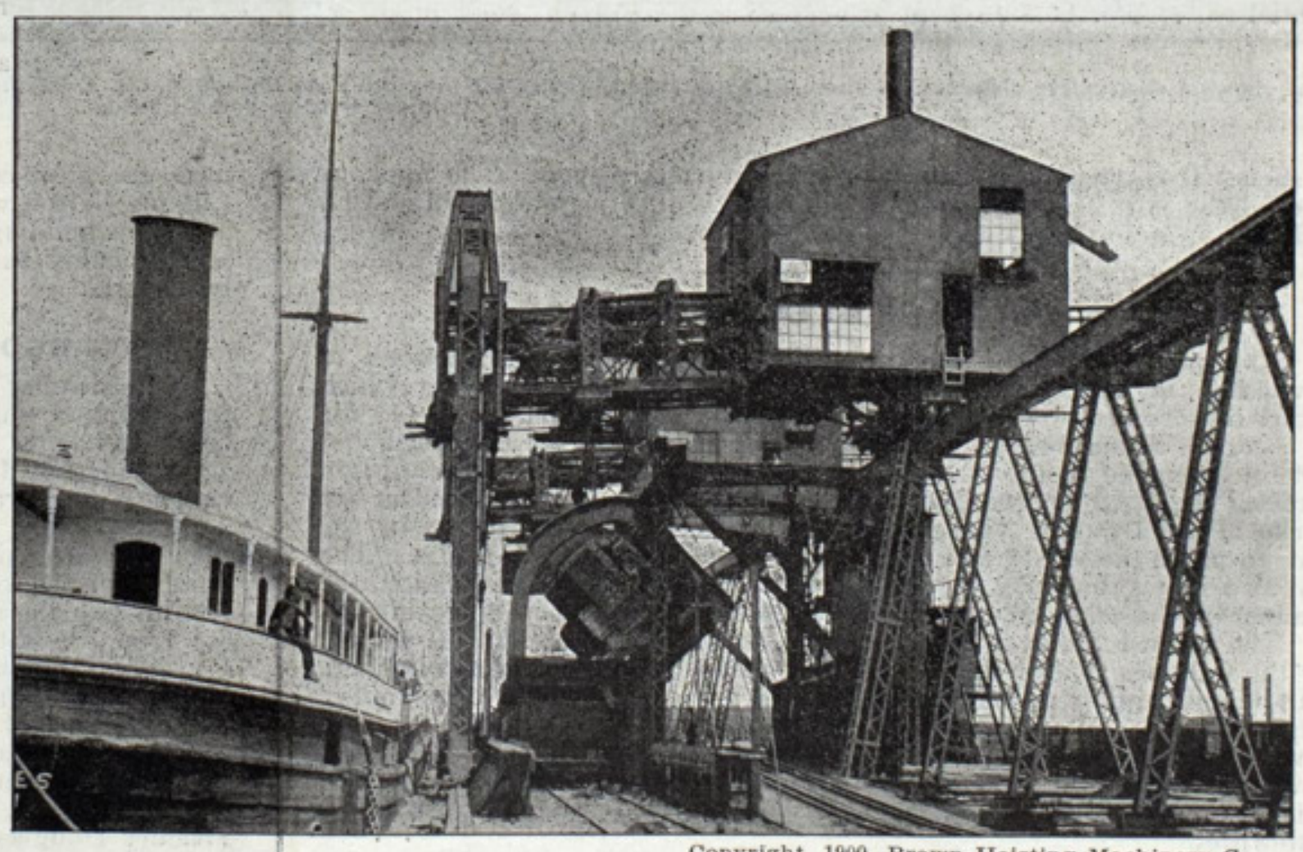
Japan, since the war with China, has increased her tonnage in naval vessels from 30,000 to 260,000. This expansion, which Lieut. Phelps describes as "enormous," has taken place in less than six years. He mentions a report that owing to suspicion of the intentions of certain powers in the far east, Japan naval circles are considering a proposal to augment the navy to the extent of either 350,000 or 400,000. It is generally believed in Japan, he says, that the scheme will be realized in the near future. Two second-class cruisers, eight torpedo boat destroyers and sixteen torpedo boats have been ordered by Japan.

The Russian budget for 1901 authorized three cruisers and six torpedo boat destroyers.

Lieut. Snowden's chapter on target practice shows that the English and French are carrying out elaborate programs to insure accuracy with big guns.

Some graphic tables prepared by Lieut. Knepper show the naval tonnage built and building for the different classes of ships of the seven principal powers. The vessels included are battleships, armored cruisers, protected cruisers, unprotected cruisers, armored coast defence vessels, special vessels, torpedo vessels, torpedo boat destroyers, torpedo boats and submarines. England heads the list with 477 vessels, having a tonnage of 1,766,855; France, although showing more vessels than England, 484, has a tonnage of only 781,065; Russia has 341 vessels, with a tonnage of 552,546; the United States, fourth on the list, 135 vessels, with a tonnage of 507,494; Germany, 261 vessels, with a tonnage of 458,482; Italy, 231 vessels, with a tonnage of 322,707, and Japan, 139 vessels, with a tonnage of 251,498. The United States rank next to Great Britain in the tonnage of battleships building, having 133,800 to Great Britain's 229,900, but stands sixth in the tonnage of battleships built, 83,094, leading Japan only. In the tonnage of armored cruisers building, the United States is third, with 109,500, being exceeded by Great Britain, with 226,400, and France with 148,260. In armored cruisers built, the United States stands seventh, or last, with a tonnage of only 17,415. Russia heads the list of armored cruisers built, with a tonnage of 83,231. In protected cruisers building the United States is third, with a tonnage of 61,403, and third in protected cruisers built, with a tonnage of 21,000. Russia heads the list of these vessels building, but is last on the list of protected cruisers built. In armored coast defence vessels, the United States leads with 43,934 tons built and 12,940 building. France and Germany have a tonnage of 43,331 and 42,873, respectively, in armored coast defence vessels built, while Great Britain has a tonnage of 38,900 in armored coast defence vessels built. Russia and the United States are the only countries building ships of this type.

This government has not built and is not building any of the craft described as "torpedo vessels." England has built thirty-five, France fifteen, Russia seventeen, Germany two, Italy fourteen, and Japan one, but none of these nations has any of this type under construction. Of torpedo



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BROWN TYPE OF CAR DUMP MACHINE FOR LOADING LAKE COAL CARRIERS.
Car being dumped into tubs for transfer to vessel.

boat destroyers, England has built eighty-nine and is building twenty-four, France has built nine and is building twenty-two, Russia ten and forty-three, the United States three and seventeen, Germany twelve and fifteen, Italy three and eight, and Japan eleven and eight. France heads the showing as to torpedo boats, with 235 built and forty-four building; England has built ninety-five and is building only four; Russia has built seventeen and is building twenty-four; the United States have built twenty and is building seventeen, Germany has built 140 and Italy 160, but neither is building any, and Japan has built thirty-eight and is building thirty-six. France with four and the United States with one, are the only countries that have built submarine boats. England is building five, France thirty-eight and the United States seven.

A typical scene at Avonmouth, England.—Unloading bananas from Jamaica from one of Elder, Dempster & Co.'s steamships.

ADMIRAL MELVILLE ON THE FRENCH SUBMARINE.

The recent startling reports as to the performances of submarine boats at the French maneuvers have increased the agitation at home and abroad of the question of the utility of these vessels for naval purposes. Rear Admiral George Wallace Melville, who has made a special study of the usefulness and efficiency of the submarine type, has given to the New York Tribune the following review of the progress and the small practical success that have been so far secured:

It is in France that enthusiasm and public interest most abound. By reason of the great desire of the French admiralty to put their naval service on an equality with that of Great Britain, and possibly by reason of their financial inability to construct as many armored cruisers and battleships as England, the French are hoping that they can develop the submarine in advance of other nations. As yet they have made no substantial progress. At the recent maneuvers of the French navy an effort was made by the admiralty to approximate as to the value of submarine boats for naval purposes. The official reports have not yet been made public. One artistic story, however, that would fittingly garnish one of Jules Verne's romances, and which was cabled to this country some time ago as to the unqualified success of the experiment, has been proved to be more sensational than real. This particular tale would tend to make one believe that the Gustave Zede, a submarine boat, went from Toulon to Ajaccio by her own means, entered the port unseen, torpedoed a battleship, and remained invisible until she rose to the surface at her moorings. The true story is that a French squadron entered Ajaccio for coal and water. The port had been declared "inviolate" owing to the projected military work not being completed, and therefore no attack could take place in that harbor. As the commander of the Zede, however, was extremely desirous of doing some work on his own account, he attempted to torpedo the battleship Charles Martel, a feat which could have been executed as successfully by any steam launch in the harbor. Since the port was "inviolate," no more preparations had been made for resisting a submarine attack than to resist an aerial one from Santos-Dumont's airship. And this is the military performance which a few misinformed enthusiasts have distorted into a feat which "shows the superiority" of submarine boats over battleships. It is now learned that, instead of steaming alone from Toulon to Ajaccio, the Gustave Zede was accompanied by a steamer which was there to tow the submarine. Very little stock in the success of that evolution is taken by naval experts, since it is well known that the whole design of the boat has been condemned by the French admiralty, and it has even been officially announced that no more boats of her character will be built. There is nothing in the evolution to impress one with the fact that anything unusual had been done. To say that this feat will do anything to convince sceptics that the submarine boat has been developed to a point beyond the experimental stage would require a vivid imagination. Considerable credit is due to the commander of the Zede, for recent experience in France with the submarines shows that the crew of the boat suffers greatly in every dive of any duration.

About two years ago the French advocates of submarine boats contended that the Narval answered all the requirements that could possibly be demanded of this type of craft. When the minister of marine subjected this boat to an official test, it required twenty minutes to submerge her. In that period the craft could be destroyed by any vessel having a machine gun, and therefore success was looked for elsewhere. She could even be run down by a torpedo boat destroyer or any rapidly moving boat. The Morse was then accepted as the proper type for the French service to adopt. Official tests and experiments showed that she possessed little more merit than the Narval, and that radical improvements would have to be made in her before an efficient submarine boat could be secured that would meet even part of the requirements demanded by the admiralty. The Farfadet is the very latest design the French have produced, and although the admiralty has been experimenting for months with her, there is no evidence that this craft is any more efficient than her predecessor.

The French admiralty, therefore, has a well defined policy in its attempt to secure a submarine boat. The design is still regarded as being in an experimental stage. The officials are not wedded to the belief that any inventor has yet secured an efficient fighting machine. It is recognized that ultimate success can only be secured by progression. We can safely follow such a wise and sensible course. The field should be kept open to every designer and inventor who has given thought to the question, and who is ready to put his study to practical use by building a craft and subjecting it to government tests. The securing of an efficient submarine boat, therefore, seems somewhat remote. If Edison's storage battery proves the success its inventor hopes it will be, then progressive advancement can be expected. As the range of action is very small with the present type of electric motor and storage batteries, the usefulness of the craft is naturally limited. Great attention is now being paid to the development of the storage battery, and any success in that direction will materially assist matters.

Fortunately for this country our naval and military experts are more interested in finding a submarine boat that can be useful in mining and countermining harbors. In work of this character the Lake submarine boat has been a commercial success, and experts believe that it is equally adaptable for naval and military purposes. The influence of Russia, Germany and Great Britain and the failure of France to secure practical success with the cruising submarine boat conclusively prove that this type of craft is still in the experimental stage. The American policy of first developing the submarine boat for mining and countermining purposes is in the line of utility, conservatism and sound military principles.

IN FAVOR OF TRIPLE SCREWS.

Several interesting facts have been gathered by Rear Admiral George Wallace Melville, engineer-in-chief of the navy, respecting the use of three screws on foreign ships, brought out by the rejection of the board of construction of the triple screw for the new battleships recently agreed upon by the experts. The three leading European powers, aside from Great Britain, are using the three screws upon all their large ships, including battleships, and it has recently been decided by Germany that it is essential that her vessels be so fitted for tactical reasons in passing through the Kiel canal. Three screws enable a ship to be handled with greater ease and sureness than one or two, and in tactical maneuvers it is decided by nautical men that evolutions can be more promptly executed with three than with two screws. Admiral Melville contends that no additional weight of machinery is required for three screws, that they produce a faster ship, and one far more economical if officers are required to use single screws on long voyages, by uncoupling the wing screws. Such ships as the Minneapolis, when so worked, he asserts, are as economical from the standpoint of coal burned as any ships of their displacement afloat and can make equal speed under either single-screw or double-screw conditions. For these reasons he believes that a most serious mistake is made in rejecting the triple screw from battleships. The same reasons existing for giving the armored cruisers three screws apply, he states, to battleships and he takes exception to the argument of line officers that high speed is not demanded of that class, and that in action they will not have to be maneuvered as quickly as cruisers and smaller ships. Of the foreign services Admiral Melville's figures show that Germany has nineteen vessels with triple screws, France twenty-nine and Russia eleven, while Great Britain has none. The United States has two in the commerce destroyers and has decided that the armored cruisers shall be fitted on the same principle. Germany has built, or is building, five warships of 11,152 tons, all fitted with three screws, and several of 11,800 tons, including battleships, armored cruisers and protected cruisers. France has ten battleships, sixteen armored cruisers of large displacement and three first-class cruisers similarly equipped. Russia has four battleships, three first-class cruisers and three armored cruisers with triple screws. The conservative policy of Great Britain has prevented the introduction of three screws. All large ships authorized for all these navies, except Great Britain's, are to be fitted with triple screws. Compared to the merchant service the navy has taken the lead in this departure from general prevailing ideas of fitting screws to vessels, as the records show not a single large merchant ship fitted with more than two screws. The increased space believed necessary for the engines of triple screws is the probable reason, for it is conceded that higher speed is obtained with three screws than two, even with the same power applied. Speaking of this subject Admiral Melville expressed the opinion that all large American warships should be provided with three screws, but he had no reason to hope that such action would follow until line officers were brought to believe that they were more economical and more easily handled than twin-screw ships.

ENGLISH SHIP BUILDING STATISTICS.

Statistics just compiled show that English builders launched in July twenty-eight vessels of about 99,356 tons gross, against twenty-two vessels of about 76,818 tons gross in June. In July. 1900, twenty-seven vessels of about 83,192 tons gross were launched. For the seven months English builders have launched 154 vessels of about 522,055 tons gross, as compared with 151 vessels of about 403,299 tons gross, in the corresponding period of 1900; 174 vessels of about 476,057 tons gross in 1899, and 189 vessels of about 482,928 tons gross in 1898. One steamer, the Walmer Castle of 12,570 tons gross, was launched at Belfast last month.

There have been launched in the United Kingdom during the past seven months 321 vessels, totaling about 890,392 tons gross, as compared with 327 vessels of about 726,879 tons gross in the first seven months of last year; 368 vessels of about 802,344 tons gross in 1899; 418 vessels of about 785,527 tons gross in 1898, and 402 vessels of about 613,256 tons gross in 1897. Among the vessels launched were the battleship Cornwallis of 14,000 tons displacement by the Thames Iron Works Co.

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MARINE REVIEW

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There is every evidence that the present week will see the termination of the strike of the Amalgamated Association against the United States Steel Corporation, or that it will be reduced to such insignificant proportions as not to be designated by the name of strike. The industrial situation has, indeed, since the last issue of the Review, undergone a decided change for the better. While the Steel Corporation has undoubtedly lost money by reason of diminished output during the past six weeks, it has gained the respect of the nation by the manner in which it has resisted the unjust demands of the strikers. It has transformed a temporary injury to itself into a permanent blessing to the manufacturing world. There is no doubt that the Amalgamated Association has done much harm to the cause of labor. The leaders of other labor associations recognize it and have taken pains to denounce the present effort of the amalgamated. As a result it is not unlikely that the amalgamation will dissolve. One thing is clear—it will never be able to remedy the mischief which it has caused to its own workers. Thousands have been thrown out of profitable employment through its unwarranted action.

It is both curious and interesting to follow the labor leader after his brief hour of authority is done. What has become of James Sovereign, once the general master workman of the Knights of Labor and of whom is was popularly reported that he could call out 1,000,000 men? He isn't even a memory. His actual occupation at present is that of insurance solicitor for a southern company. There's Debs. Six or seven years ago people were seriously thinking of running him as an independent candidate for the presidency of the United States. Today he could not conjure a single vote. The American Railway Union with which he blocked the railway traffic at Chicago for awhile is no longer in existence. No man's word had greater weight ten years ago than Terrence V. Powderly's. He was the idol of the workingman and his organization, the Knights of Labor, seemed to be supreme. What's become of both of them? Powderly was a government employe under the first McKinley administration and the Knights of Labor is nearly defunct. Let Shaffer look at the long line of labor leaders and he may read his future.

It needs but a casual glance at "Notes on Naval Progress," published by the naval intelligence bureau, to show that every maritime nation in the world is making great additions to its naval strength. Even Spain is resurrecting her powers. England, as usual, leads. She seems to cling more determinedly than ever to her practice of having a naval strength equal to any two nations that may be arraigned against her. The United States stands next to Great Britain in the tonnage of battleships building, with 133,800 as against 229,900. The United States is sixth in the tonnage of battleships built and fourth in the matter of all ships finished and unfinished, with a total tonnage of 507,494. Germany has a tonnage of 458,482. The Review pointed out in its last issue the mercantile growth of Japan. The same is true of her naval growth. Six years ago Russia deprived her of the fruits of her victory over the war with China. Since then Japan has been adding to her navy. During those years she has brought her tonnage up to 260,000 and is now contemplating an addition of 400,000 tons. The advantage which Japan has is that her naval strength is entirely new.

It is well that the government officials have imposed a fine of $1,000 on the lake steamer Alexander McDougall for not stopping to assist in the rescue of passengers after sinking a ferry steamer near Port Huron. The fine will no doubt be remitted, on account of the explanation of Capt. W. H. Kilby of the McDougall, that in view of the number of small boats that put out from docks to the rescue he concluded he could do most good by getting out of their way, which is quite reasonable, but the incident will serve to direct attention to the law of rescue under such circumstances.

Postal officials are certainly to be congratulated upon the valuable service that is rendered to lake shipping interests through the Detroit marine post office. During the month of August the Detroit office handled 55,131 pieces of mail. Of this 40,267 pieces were delivered to and 14,864 pieces received from the boats. Money orders issued numbered sixty-two, amounting to $1,280.45. The total passages during the month were 3,254. The largest number of passages for a single day was on Sunday, Aug. 25, when 175 boats passed.

FORE RIVER SHIP & ENGINE CO.

A PICTURESQUE STORY REGARDING A LUSTY YOUNGSTER IN THE SHIP BUILDING INDUSTRY—PUTTING UP PLANT AND SHIPS TOGETHER.

It is a very entertaining account, with a quality more literary than technical, that Benjamin Brooks writes in the Boston Evening Transcript of the new yards of the Fore River Ship & Engine Co. at Quincy, Mass. It certainly gives one the impression of American vim. It is a case where the ship and shipyard is progressing at one and the same time. Following is the story:

If you would behold the American spirit in its purest, strongest and most buoyant phase—catch it on the wing, so to speak, learn the rate at which things under its inspiring influence can be made to happen, and see how truly robust and promising an infant is a ship building plant, reared under its guidance, at the tender age of fifteen months—go to Fore River. But it will not seem as if you were going to visit a prosaic mechanical institution at all. When you leave the train you are, with all due respect to one of Boston's suburbs, in a country town. When you have ridden a mile or so in the "one-hoss chaise" over a crooked, picturesque, up-and-down country road, you have the picnic feeling strongly and have entirely forgotten that you are bound in the direction of battleships and ringing steel. Then, suddenly, at the last bend of the highway, you come upon a group of dark, trim-looking buildings tiered with windows, smoke and steam issuing thinly from their stacks, while beyond is a glimpse of green marshes and blue water. These are the works. Things have been happening so fast here that the attendant circumstances have not had time to catch up. Instead of the unsightly railway cuts, the long rows of workingmen's cottages, the cinder dumps and piles of old iron that usually indicate the approach to a great manufacturing plant, it is all green country and old-fashioned homes up to the very gates of the factory. Within the enclosure the marks of rapid growth and transition are still more striking. Old homesteads are serving as gate houses or emergency hospitals, farmhouses as restaurants, and all between, where there should properly be piles of steel and lumber, scrap heaps and barrenness, is waving green fields, with meandering foot lanes criss-crossing them from one shop and another. The sounds of riveting hammers intrude harshly in such surroundings, and seem not so appropriate as the would-be tinkle of cowbells. Apple trees, with the fruit still on, grow so near by that the apples drop from them in sheer astonishment at the earth-jarring blows of the big steam hammer.

At Fore River two things have been going on; the building of ships and the installing of a plant to build them. Logically, the plant should come first, of course, but as a matter of fact the two enterprises have been carried on so side by side and intermingled that the ships, during the confusion, have managed somehow to come out ahead. This is most distinctly an American way of doing things—to start at nothing, to keep moving at all hazard, and decide upon conveniences and methods afterward; as if, for instance, a man were suddenly to determine to go somewhere, rush away to catch his train, buy a tooth brush at the first station, a popular novel at the second, a change of clothes at the third, and so on, fitting himself out as he went along. No even-minded European could ever proceed in such a manner; yet the scheme is a good one, economical and not without foresight. The lighter vessels which had been contracted for are, under this system of procedure, almost completed. Had they waited for the building of the plant they would not have been started yet. The plant thus improvised is not capable of dealing expeditiously with large battleships, but while the battleships are still only on paper, concrete foundations begin to grow in the field like mushrooms, heavier machinery is moved into place and bolted down, and then some fine morning they begin pushing the end of the machine shop a few hundred feet out into Uncle Zeke's orchard, boarding up the space between and roofing it over; and in an incredibly short time it is twice as big as before. All the buildings are placed so they can be extended and enlarged without interfering with one another. Everything is going to be just twice as big as itself in the course of a few moons; yet all this without interference with the work on the ships, or even so much as a growing pain. When the woodworkers were idle, after getting out the battleship patterns, then was the time to add to the machine shop. When their heavy forgings were ready to be moved, then was the time to lay the railway tracks down to the water. While the keels are being laid on the beach, the dredgers are scooping out channels to float the vessels of which they are a part, the piledriver is building docks for them, and whereas there is nothing now with which to lift their boilers and engines into them, by the time the boilers and engines are made there will be a huge gantry crane running up and down what is now a pretty, pebbly beach, ready to handle anything under seventy-five tons, to place machinery, to step masts and smokestacks, or to put on armor plate.

This distinctly American spur-of-the-moment way of getting a great plant together is one of the principal reasons for our being so many years ahead of the rest of the mechanical world. The other reason is to be found more graphically demonstrated by going into the shops themselves. It is that extraordinary willingness on our part to install new methods. In England, and indeed in all European countries, they use their machinery till it wears out. We cannot afford to do that. Long before it is out of repair it is out of fashion in this country, and it is cheaper to let the old machinery rust in the scrap heap and replace it with more efficient and economical kinds as fast as they are invented than to go on wasting time with it. The shops at Fore River, therefore, are as different in appearance from those installed ten years ago as door knobs are from gooseberries. The principal contrast lies in the fact that the machines, instead of being driven all from the same shaft by whirling pulleys and slatting, screeching belts, are each provided with a separate electric motor. Each lathe, each punch—even the grindstones—are run in perfect independence of the rest of the shop. Electricity is such extremely clean, noiseless stuff and so much unnecessary noise and dirt and dripping oil are done away with by its use that it is hard to imagine one is in a machine shop at all. But though the advantages of it, in matters of light, cleanliness and quiet, are immediately apparent to the senses, for an appreciation of the financial advantage we must get out our slates. It often occurs in a ship building works that one machine, either to save time or in order not to interrupt the boring of a cylinder, for instance,

which, once begun, cannot be stopped, must be kept running all night long while the rest of the shop is idle. Now horse powers cost at the very least two cents an hour; and the main shafts and idle belts and pulleys of a large shop, without accomplishing anything, require about 150 H.P. to keep them going. This at the end of a ten-hour day means $30, and at the end of the year $9,000, gone to waste in simply making a noise. To be able to run one machine at a time and to generate just what power is needed for it is obviously then a great advantage. There are other ideas just as new and well adapted for time-saving—the idea of making the ship crane run up and down the dock, for example, instead of having to move the ships about under it; and the scheme of an auxiliary floating machine shop to enable the workmen to have power-tools close at hand, no matter where the vessel is on which they are at work.

So much for the shops. Now the ships themselves—the important part of the institution—are each in a different stage of construction, and the more interesting on that account. First there is Crowninshield's seven-masted steel schooner. The reason she's a seven-master is because she's just short of an even 400 ft. long; and the reason she's of steel is that she has passed beyond the limit of wooden construction. Just as in high buildings, the limit was reached in stone when the walls had to be so thick at the bottom as nearly to fill up the lower floors, so in wooden schooners the limit of length was reached, apparently, in the six-masters when the keelson, in order to be stiff enough, had to be so big as seriously to detract from the cargo space. Besides the advantage of large inside capacity for outside size, she will be able to carry water ballast just as steam ships do between the outside bottom she sails on and the inside bottom on which the cargo rests. She may run aground and puncture her outer tire, so to speak, without sinking, so long as the inside bottom remains intact, and may even venture to collide with her sister seven-masters, if such there should ever be, provided she hit forward of her collision bulkhead. But all these particulars will not be evident to the average eye, for as yet there is not so much as a keel laid for her, and she exists merely in a gigantic, full-sized drawing, scratched into the smooth floor of a loft about 300 ft. long. The curve of each rib; the shape of the bow and stern—it is all there if you can but find it, and a lot of men are shaping light wooden patterns to the curves on the floor, which will serve bye-and-bye to bend the frames to.

The two sister line-of-battle ships New Jersey and Rhode Island are in somewhat the same state of not-yet-ness. A few days ago you might have seen their huge arching prows modeled in wood going to the foundry, and in a few days more you may see them returned and set up in place cast in solid steel—a pugnacious, sharp-nosed-looking pair they are, too. For the rest of them you will have to look sharply in among the piles of heavy forgings lying about the forge shop. You may find a piece of shafting here, a part of her engines there, but to really see what they are to be like will bring you to the draughting rooms, where there are drawings of them—hundreds of drawings down to the minutest detail, and the head draughtsman will, with a goodly pile of them in front of him, explain all about these stalwart twins—how they are to be 435 ft. long, which is longer than first-class line-of-battle ships have been so far; and are to go 19 knots an hour, which is faster than vessels of that class have yet been driven. And you may see how their turrets are pivoted; how the sides are offset at the waterline for the 11-in. armor, and the way the signal wires and tubes are conveyed from the conning-tower down through a heavily armored well to "central." Yes, a first-class battleship must have a "central," so that the commanding officer can maintain his heroic attitude on the bridge and at the same time, by means of a speaking-tube or telephone, communicate to the kitchen that he intends withdrawing from the combat for breakfast and wishes hot coffee at seven; or to the engine-room to deuce take the torpedoes and go ahead. When, two years from next February, these two fighters are done and the government has paid $3,405,000 apiece for them and put aboard their crews of 658 men, they will appear like two very creditable islands floating in the harbor.

Now when we come to the Des Moines we have a very much smaller, lighter, less terrible vessel, more like the Olympia—not supposed to appear in line of battle, but more to make it everlastingly inconvenient for the enemy's commerce, to go long voyages at a good speed and be everywhere at once. But she has the advantage over the others, at present, of actually existing, not merely on paper, but in good hard steel. There she is, propped up on the beach at the margin of a little blue inlet, looking as out of place among the rural surroundings as if she had gone ashore in a storm. She is at that noisiest and patchiest stage when the light shines through her in places where plates are yet to be riveted on, and riveting hammers racket all about her, inside and out. Teak sheathing is beginning to grow on the outside of her, but her interior is as hollow as that of any tramp, dark and cavernous and to be reached only by long, rickety ladders. But by next November she will appear quite different. There will be a crowd of spectators, a bottle of champagne broken over her prow at the end of a long ribbon, and she will slip smoothly overboard into the water. Meanwhile it is her engine cylinders that you see revolving slowly in the boring mills, her shafts that are being drilled out at the tedious rate of 10 in. an hour with a hole through the solid steel from one end to the other. This is to gain lightness, you see, without loss of strength. The smooth, long, round bars are the drills, creeping slowly in, as the shafts revolve around them, and the little brass pipe at their sides carries in a steady stream of oil to where the cutting is going on at the end of the hole, which washes the chips out with it on its return. There is no other shop, by the way, where the core of a solid steel shaft can be drilled out for a distance of 50 ft. without once stopping. Over in the smithshop, under the big steam hammer (standing giant-like and grim in the gloom of the rafters, its frame straddling the anvil like a colossus, the third largest hammer in the country) it is for the Des Moines, also, that the sparks fly in a vivid sheet to the farthest corners of the building, that the ground around is set quivering in response to the resounding blows, and the furnaces glow beside, spouting white flame. The engines, boilers, and hull of a vessel, you observe, must all be made at once separately, and woe be to him by whose mistake they fail to come together at their completion.

I said that in respect of being finished, the ships had come out ahead of the works. Now if you have tired of mentally putting the parts of vessels together, come down to the end of the dock and you may see all complete (save for gatling guns and torpedo tubes, which have not yet arrived), the most spiteful, vicious looking pair of Boston terriers that ever barked in time of war. They are known as the Macdonough and the Lawrence—torpedo boat destroyers; and you may see by the rake of their four stubby smokestacks, their low, straight black decks and hooded noses that their dispositions are not good; that they would rather sneak along in the dark than fight in the open, and by their lightness of construction (for they are only 1/16 or ⅛ in. thick) that they prefer to trust for safety in their speed rather than in their armament. The object of a torpedo boat destroyer is to overtake and destroy torpedo boats. She must be faster than they, then, and consequently lighter and more slender of build. So when you go down stairs through a hole in the deck, whether it is to the captain's cabin or to the engines and boilers, you find everything of the lightest, the most compact and most economically spaced. These boats are divided off into separate compartments by bulkheads. The forward engine room for the starboard screw has no connection with the after engine room for the port screw. The crew's quarters and boiler spaces are similarly boxed off, so that even though the smallest shot will pass through them with ease, still they may not fill entirely with water and sink. You will find it hard to believe that in these two little sardine-box engine rooms is crammed seven or eight times the power of the yacht Dreamer, for instance, or almost enough for an Atlantic liner. Such is the case, however.

The Lawrence has already been trying her strength and speed over a measured knot—6,080 ft. that is—in the neighborhood of Gloucester. They time her like a race horse with a split-second stop-watch. She has already got tuned up to two minutes and a very few seconds, and when she has done it in two minutes flat she will be taken to Newport to try a longer distance; and when she has gone steadily at 30 knots an hour for four hours without hitch or mishap then she will hold the world's record for vessels of her class and will be accepted by the government. We should be proud of the Lawrence and her twin sister Macdonough, for they were built not from government designs, but from improvements on them made by our neighbors at Fore River. Every last detail of them was contrived especially for them without regard for standards, with the result that they have themselves become standards for speed and lightness at Washington.

However, it was not for this that I got you down to Fore River in the first place, nor to see the beginning of the two largest, fastest, most powerful battleships in the navy; nor the only seven-masted schooner in the world; nor yet on account of the big hammer, nor because in no other ship yard is there room and facility to build an even half-dozen 700-ft. steamers side by side and have cranes and machinery to keep them all going. It is something broader and more magnificent than that and won't go down in figures. The whole concern is so typical of the great movements on foot nowadays, so essentially twentieth century, so new; and I say, again, if you would see what we Americans, on the move, are really like, go to Fore River.

SUMMARY OF VESSELS DESTROYED DURING 1900.

The statistical summary of vessels totally lost, condemned, etc., just published by Lloyd's Register of Shipping, shows that during 1900 the gross reduction in the effective mercantile marine of the world amounted to 848 vessels of 677,182 tons, excluding all vessels of less than 100 tons. Of this total 296 vessels of 386,304 tons were steamers and 552 of 290,878 tons were sailing vessels. As regards steamers the present return exceeds the average of the previous nine years by sixteen vessels and 27,554 tons: as regards sailing vessels it is below the average by 274 vessels and 83,968 tons. The figures relating to steam and sailing tonnage owned by Great Britain are below the average by 14,000 and 20,000 tons respectively. The summary exhibits interesting data as to the relative frequency of the different kinds of casualty which conclude the existence of vessels. Strandings and kindred casualties which are comprised under the term "wrecked" are much the most prolific cause of disaster. To such casualties are attributable 47 per cent. of the losses of steamers and 45 per cent. of the losses of sailing vessels. The next most common termination of a vessel's career is by condemnation and breaking up, about 17 per cent. being accounted for in this manner. Collision claims about 12 per cent. Following is the list of removals from the world's tonnage during the past ten years:

	Total removals.		Broken up, condemned, etc.		Loss by misadventure.
	Number.	Tons.	Number.	Tons.	Tons.
1891	1086	649,946	140	66,445	583,501
1892	1008	625,224	198	110,067	515,157
1894	1154	708,971	227	149,256	559,715
1895	1237	806,278	247	170,849	635,429
1896	1051	737,779	238	186,149	551,630
1897	1045	726,800	227	172,010	554,790
1898	1141	820,725	224	165,267	655,458
1899	996	783,508	210	152,340	631,168
1900	848	677,182	146	120,539	557,643

LARGE SHIP TO BE BUILT BY CRAIG COMPANY.

On Saturday last the Craig Ship Building Co., Toledo, closed a contract for a steel freight steamer of about 5,500 tons capacity with Mr. Colin McLachlan of Port Huron, managing owner of the steamer Kittie M. Forbes and the schooner Mary E. McLachlan. The new steamer will be 390 ft. over all, 370 ft. keel, 48 ft. beam and 28 ft. deep and will be the largest vessel ever turned out of the Toledo yard. She will be equipped with triple expansion engines, having cylinders of 22, 38 and 59 in. diameter and 42 in. stroke. She will have three Scotch boilers, allowed 170 lbs. of steam, and will cost about $230,000. Delivery is promised at the opening of navigation next spring. The combined capacity of the twenty-one freighters (twenty being on the stocks of the American Ship Building Co.) pledged to come out next spring is 115,250 tons on a single trip.

The Cleveland Pneumatic Tool Co. has opened a Chicago office at No. 335 Wabash avenue, in charge of H. S. Covey, where samples of their complete line of chipping, beading and caulking hammers and the "Cleveland" long-stroke riveting hammers, as well as piston, rotary and breast drills may be seen.

PETROLEUM AS FUEL.

REASONS WHY IT CAN BE REGARDED AS A COMPETITOR OF COAL—GREAT PRODUCTION OF COAL AS AGAINST PETROLEUM.

Mr. A. Adiassewich has contributed an article to Fairplay upon the subject of petroleum as fuel, which is of peculiar interest now that petroleum is occupying a definite field as fuel in the west and is the subject of some experiment in steamship propulsion. He says:

Petroleum, in its roles as fuel, can hardly be regarded as a competitor of coal, for the simple reason that the total output of petroleum is merely a fraction of that of coal. In 1899 the world's production of coal reached 670,000,000 tons and will probably amount to 700,000,000 tons at the end of the present year. The quantity of petroleum obtained during 1897 did not exceed, on the authority of Prof. Zaloziezky, 15,600,000 tons. Making due allowance for the extensions carried out at the older oil fields and the opening up of new oil regions such as Borneo, Texas, and several others, the output during 1901 will probably reach 30,000,000 tons; this figure is, of course, merely an estimate or guess, but even then it will only amount to 4.3 per cent. of the total production of coal.

Another point worth considering is that only a certain part of the petroleum as it is obtained from the earth is applicable to fuel purposes, and that the other part is distilled off, yielding kerosene and other more valuable products. The amount available as fuel is thus reduced to about half the quantity of the crude, that is to say, to 2.15 per cent. of the coal production. Very likely the above percentage is rather low, large quantities of coal being utilized in metallurgical operations; still the difference it would make in the total consumption is not worth serious consideration and there could hardly be any question as to competition. So far as regards the present, and even the future, the chances of petroleum as a substitute for coal do not seem to improve.

The extensive coal beds are estimated at thousands of millions of tons. including those of England and America, which are especially rich in coal; according to Dr. Shults, a comparatively small Westphalian coal basin alone is estimated to contain about 129.3 milliards of tons of coal. As to the resources of Russia, the region of the Don alone is estimated to contain about 17,000 million tons of coal. Remembering now that there are still enormous stores of coal in localities where its presence is as yet unsuspected, there is reason to believe that the supply of coal is more or less assured for many centuries to come, though its consumption should increase a hundredfold.

On the other hand the present prolific oil fields are sure to show signs of exhaustion in a few decades. Of course, new oil fields are being and will probably yet be discovered, but it is hazardous to estimate the extent and productivity of the oil beds, a comparatively simple matter in the case of coal. Therefore, if one may affirm with a degree of certainty that mankind is well provided with coal for a more or less indefinite period, the same can hardly be said regarding petroleum, that is to say, petroleum as "the fuel of the future" appears only a very remote possibility.

The whole subject appears in a different light if we consider the respective qualities of the two combustibles, i. e., where the higher calorific effect of petroleum comes in, bearing in mind its relative price to that of coal.

Naturally, the above merely applies to petroleum in a general sense. In singular cases, for instance in Russia, liquid fuel, owing to its cheapness, has completely supplanted coal in localities adjoining the petroleum producing centers or within easy reach of the Caspian and Volga fleets. The same remark applies to certain parts of the United States and Roumania. Here liquid fuel has also commenced to compete successfully with coal. But, after all, these are only exceptional instances. In Pennsylvania, coal is utilized and considered the cheaper fuel in refining petroleum itself. In Russia, even in the midst of the petroliferous centers, the price of petroleum experienced during the beginning of the present year a drop of 50 per cent., when many metallurgical works which consumed a considerable quantity of coal came to a standstill in consequence of industrial depression just then prevalent all over the continent; otherwise its application was out of the question.

Another point to be considered is that the supply of liquid fuel from the old oil centers could not compete on the universal markets with coal because so far all the liquid fuel obtained is generally consumed in the respective countries of production themselves, besides a considerable quantity of coal, as is the case in Russia, Galicia and Roumania. Roumania is hardly in a position to export any oil fuel if it were not working its own coal mines, besides importing yearly considerable quantities of coal from abroad. One of the principal oil producing centers (Pennsylvania) converts its crude into kerosene and other products of greater value than liquid fuel, so that it hardly contributes in any way the smallest quantity of that fuel. Thus we see that in our search for large supplies of liquid fuel we have to look to the comparatively new oil fields of Borneo, California and Texas. These localities apparently contain rich oil beds, and the crude obtained at these, forms, by reason of its physical and chemical properties, an excellent liquid fuel in its natural condition. These localities will probably contribute several million tons per annum for a considerable time to other countries which have no oil resources.

The application of petroleum as a fuel dates far back, being put to very primitive purposes, first in the preparation of food, then in lime kilns. For industrial purposes it did not come to the front previous to the sixties of last century. At that time the first burner for liquid fuel was invented. Even the primitive burners gave excellent results, and these, in conjunction with the discoveries of extensive petroliferous areas in America and Russia gave an impetus to the introduction of improvements in the appliances for burning oil. Experiments were conducted in many countries, chiefly in America, England and Russia. The first attempt to utilize petroleum as a liquid fuel was made as mentioned during the sixties. At the very start its superiority to any other combustible was made evident; its heat producing effect exceeded that of any other combustible, it occupied smaller bulk, it left no ashes, and its handling presented smaller difficulties, as it could be automatically fed to the burner on the principle of gravitation, thus saving expense in storage and on stokers in comparison with other fuels. The above advantages are of the greatest importance in the handling of steamers and, in consequence, nearly all experiments were conducted with this end in view. Mr. Biddle and Messrs. Shaw & Lindon of America, were the first inventors of liquid fuel burners; St. Claire Deville, a Frenchman, Mr. Adon, an Englishman, and Mr. Shpakovsky, a Russian, applied themselves to find a solution of the problem, and many other experiments were conducted elsewhere.

Previous to entering on a discussion regarding the respective merits of the oil burning furnaces, I will say a few words regarding petroleum in general, and its qualities as a fuel in particular. Though it may safely be assumed that the elementary properties of crude petroleum are more or less a matter of common knowledge, I think it will not be superfluous to give a brief resume, in order to make my further statement clearer.

In chemical composition and properties petroleum in its crude state varies according to the locality where it is found. Generally speaking, petroleum is composed of hydrocarbons with small percentages of oxygen, nitrogen, sulphur, iron, etc. The specific gravity of the various crudes ranges between .750 to .965. The lower the specific gravity the more gaseous and volatile constituents enter into the composition of the respective crude, and the less is its viscosity. Vice versa, oils of greater specific gravity show a corresponding decrease in gaseous and volatile substances and a proportional increase in viscosity. This rule is anything but absolute. Thus, Baku petroleum raised to a specific gravity of .950 by distilling off its lighter constituents is a highly viscuous liquid at 60° Fahr.: Borneo crude of a higher specific gravity—.963—remains fluid at 60° Fahr.

Petroleum is a highly inflammable liquid, leaving no residue on burning if perfectly pure and supplied with an adequate volume of air. In an inadequate supply of air, it burns with a red smoky flame and deposits a considerable amount of soot. The degree of inflammability varies with the chemical composition of the respective oil. The light varieties of petroleum which contain a large percentage of volatile constituents, ignite at a very low temperature, even at 0°C. on the application of fire. The heavier varieties, chiefly those deprived of their lighter constituents, ignite at considerably higher temperatures, at 50°, 70° and 100°C., etc.

The thicker kinds of oils, though possessed of a high flashing point, do not admit of being applied in quantity to fuel purposes—automatical feeding by gravitation of the burners being out of the question. Neither do the light varieties lend themselves to this purpose; the storage and transport of these is fraught with great danger, and being mainly composed of highly volatile hydrocarbons, their use would be attended with considerable loss by evaporation. Consequently a crude to meet the requirements in question must be possessed of a sufficiently high flashing point to insure safety of working, and its viscosity should not be high enough to impede the free automatic flow of the oil to the burners. So Borneo and Texas crudes admit of being utilized as a fuel in their natural state. Crude oils in which the above qualifications are wanting have to be treated accordingly, as for instance Baku crude; here the lighter constituents, which include benzine and kerosene, are distilled off and the 62 per cent. of residuum, locally known as "astatki," represent an excellent fuel. The specific gravity of this residuum ranges between .905 and .915, its flashing point being near 212° Fahr. A glowing splinter plunged into it does not ignite the whole mass, but is immediately extinguished. One cubic meter of residuum weighs roughly 920 kilogrammes and in calorific value equals thrice that volume of coal. Its chemical composition is C_nH2_n; a small percentage of O and traces of N., S., and certain mineral salts are always present. Prof. Mendeleieff determined the composition of astatki: C-86 per cent.; H-12 per cent.; O-1.65 per cent.; S-0.30 per cent.; N-0.05 per cent.

Numerous experiments have had for their object the determination of the heating effect of petroleum. Those carried out by St. Claire Deville are more complete than other series, and therefore I append his table, merely supplementing it with data regarding oils from the recently discovered oil fields:

	Kind of Petroleum.	Spec. Gravity at 0°C.	Carbon.	Hydrogen.	Oxygen.	Calorific units.	Lbs. of water evaporated per lb. of fuel consumed.*	Determined by.
1.	E. Virginia heavy oil.....	0.873	83.5	13.3	3.2	10180	14.58	St. Cl. Dev.
2.	E. Virginia light oil.....	0.8412	84.3	14.1	1.6	10223	14.55	? "
3.	Pennsylvania light oil.....	0.816	82.0	14.8	3.2	9963	14.05	"
4.	Pennsylvania heavy oil.....	0.886	84.9	13.7	1.4	10672	15.30	"
5.	Ohio heavy oil.....	0.887	84.2	13.1	2.7	10399	14.88	"
				o.s.n.				
6.	Java heavy oil.....	0.923	87.1	12.0	0.9	10831	15.02	? "
7.	Java heavy oil.....	0.827	83.6	14.0	2.4	9593	13.65	? "
8.	Java heavy oil.....	0.972	85.0	11.8	2.8	10183	14.11	?? "
					o.n.			
9.	W. Galicia heavy oil.....	0.870	82.2	12.1	5.7	10005	14.23	? "
10.	E. Galicia heavy oil.....	0.885	85.3	12.6	2.1	10231	14.79	"
11.	Baku heavy oil.....	0.938	86.6	12.3	1.1	10800	15.55	"
12.	Baku light oil.....	0.884	86.3	13.6	0.1	11460	16.07	"
13.	Balakbani heavy oil.....	0.882	87.4	12.0	0.1	11700		"
14.	Baku residuals	0.928	87.1	11.7	1.2	10700		"
15.	Roumania Campina		86.17	13.79	0.4	11007	15.69	Coucou.
16.	Roumania Ocnitza		87.57	11.37	1.06	10476	14.79	"
17.	Borneo	0.963	87.90	10.78	1.24	10322	14.49	Laboratory of Messrs. Samuel & Co.
					o.s.n			
18.	Texas	0.910	85.66	11.03	3.31	10247	14.40	University U. S. A.

*Re evaporation—not theoretical but practical figures—the theoretical is about 10 per cent. higher.

For the sake of comparison I also append the following table:

Locality of Origin.	Heating power. Centigrades.	Lbs. of water evaporated by 1 lb. of fuel at 100 C. Theoretic.	Practical.
Welsh coal	8241	14.983	8.99
Newcastle	8220	14.945	8.96
Lancashire	7733	14.06	8.43

A comparison of the above tables brings clearly out the superiority of petroleum. Assuming the calorific value of coal as one, that of liquid fuel would be 1.75; but in practical work the heating effects of the two fuels are rather like 1 to 2. With coal there is always an unavoidable loss

in coal dust and in heat escaping through the chimney—drawbacks never experienced with liquid fuel.

Another factor deserving our attention is that in the combustion of coal considerably larger volumes of air are needed than is theoretically required; this, of course, tends to lower the heating effect of the fuel. With liquid fuel, the volume of air required for perfect combustion is only slightly in excess of the one theoretically necessary.

The heating effect of a fuel may be calculated according to the formula: $Q=8080C. + 28.000 (H-\frac{O}{8})$. In practical work, however, this formula is found wanting in accuracy. Dr. Langbein advocates the following formula:

$$\frac{8500C+27.000H+2500S-600\ (2650\ 0+(9H+W)\ .600}{100.}$$

The above has been reduced by Prof. Mendeleieff to: Q—81C+300H-26 (O-S). Good practical results have been obtained with the last formula.

From the above we also glean that the calorific value of an oil is in ratio to the presence of oxygen and other elements.

REPLACING LONG BRIDGE AT WASHINGTON.

The Scherzer Rolling Lift Bridge Co., Chicago, has issued a most pretentious volume to show the advantages to be derived by placing a draw of the rolling lift type, instead of the swinging type, in the proposed new bridge across the Potomac at Washington. For a rambling wooden structure of no architectural beauty whatever the old Long bridge at Washington is one of the most famous in the world. It was the sole connection between the union and rebel domain during the civil war. This bridge is now to be replaced by two new bridges, one being a double track railroad bridge near the site of the present long bridge and the other to be a highway bridge, which will accommodate street railway traffic, and which is to be built not less than 500 ft. above the long bridge. The plans of both bridges are to be approved by the secretary of war. It is against a design of the railway bridge submitted by a representative of the Pennsylvania railway that the Sherzer company protests, on the ground that it is too severely plain for a city abounding in such architectural splendor as Washington. The company represents also that the type of the railway bridge must necessarily control the design of the highway bridge. It therefore pleads for a more artistic bridge and submits a number of exquisite illustrations to show wherein the Sherzer bridge lends itself to beautiful effects without destroying its strength and practicability.

A new chart, in colors, of Erie harbor and Presque Isle, has just been issued and may be had from the Marine Review. A new chart of Buffalo harbor and Niagara river to the falls is also in print.

SCHERZER ROLLING LIFT BRIDGE ACROSS THE CHICAGO RIVER AT TAYLOR ST., CHICAGO—VIEW OF BRIDGE OPEN FOR NAVIGATION.

One of the thirteen large rolling lift bridges of Scherzer Rolling Lift Bridge Co. type (headquarters in Chicago) now in successful use. Fifteen additional Scherzer rolling lift bridges in process of construction.

FAVORABLE REPORT FROM THE ANCHOR LINE.

The detailed report of the board of directors of the Anchor line, which was read at the annual meeting of the company, held in London a few days ago, has just been received. It shows that the line had a fairly prosperous year. Chairman Richard Henderson in moving the adoption of the report said:

"When we met at this time last year it was a pleasure to us to be able to present a satisfactory account of our first year's stewardship, and this time it is again our privilege to offer you what I think you will all agree is a favorable record of our second year's operations. In the Glasgow and New York freight and passenger business our earnings have favorably compared with those of the previous financial year; of late, however, homeward cargo rates have been very low and full cargoes have been very difficult to obtain. Our Indian trade continues restricted. Outward cargo both to Bombay and Calcutta has been none too plentiful, and homeward cargo scarce, owing to poor crops resultant from the long period of plague and famine. Indeed to Bombay we had fewer sailings in the year under review than in the preceding twelve months. We have improved our service very much in the last twelve months by the addition of new tonnage, with the result that we continue to stand well with all sections of the public at home and in India. The Mediterranean and New York trade has both in freight and passengers been fairly satisfactory, and we have enjoyed our full share of both. The Italian emigration was fairly brisk this spring, but is a very spasmodic and uncertain affair, and is usually confined to a short season. At the present time things are distinctly slack, and though we shall no doubt see the usual revival in freight, at least in the autumn, still we are suffering from the fact that more competitors have entered the field than there is room for. It will be interesting to you to know that we continue to purchase coal largely in America and also in India at prices advantageous to our Atlantic and Indian services and, although home prices have during the last few months become much more reasonable, as the summer advances I am in hopes we shall see still further reductions and thus obviate buying so much foreign fuel, which must mean a serious loss of trade to this country. Still our coal bill for the last year was greatly in excess of that for the previous year. The total profit for the twelve months amounted (after deducting all expense) to £157,656 5s. 5d. to which falls to be added the amount brought forward from last year, thus making a total of £178,-243 12s. 11d. After deducting the debenture interest and preference dividend for the twelve months the net amount remaining is £147,387 6s. 7d., which the directors recommend should be disposed of as follows: To write off for depreciation the sum of £45,000; to carry reserve fund £50,000, which now brings this fund up to £100,000; and to pay a dividend of 8 per cent. on the ordinary shares, and carry forward to next year the sum of £32,387 6s. 7d. I think you will be pleased at the position of the reserve fund and the substantial amount carried forward."

SCOTCH SHIP YARDS FULL OF WORK.

FREIGHT OUTLOOK ONLY FAIR, BUT DEMAND IS MOSTLY FOR "TRAMPS" OF ALL SIZES—MATERIAL STILL HIGH IN COST—THE COAL TRADE.

[Special correspondence to the Marine Review.]

Glasgow, Scotland, Aug. 22.—When I wrote about the condition of the ship building industry at the beginning of June last, I said that as regards Scotland it had begun to assume a better appearance, and that the prospects were that builders would have by no means a bad year. Since then there has been quite a spurt of orders and the position now is that builders have on hand—that is to say on the stocks, and on their order books, and not counting what has already been put into the water though still unfinished—considerably more tonnage than at the beginning of the year. The contracts actually booked are pretty well distributed among the yards, though of course some are better off in respect of forward business than others, and there are enough to give tolerably full and active employment till next mid-summer at least. Now this means a great deal at this season of year, for it is not usual for ship builders to book much in June and July. The active contracting season may be called August to October, and that has only just begun. This is why it is reasonable to expect that there will still be a great deal more booking in the next two months or so, in which case Scotch ship builders will wind up the calendar year with quite an unprecedented amount of business on their books, and in this forecast I am not including government work, none of which has been booked for several months past. But according to the admiralty program the building of at least four big cruisers is to be given out to private contractors during the autumn, and it is probable that the Clyde will obtain the half, if not the whole of the contracts, in addition to the mercantile work on hand.

It is not easy to account for this revival in the demand for merchant shipping at the particular time when it has occurred. Cost prices had certainly not reached the level from which they sprang three years ago, although they were within measurable distance of it. Coal was, and still is, comparatively dear, and the freight market was and is ruinously low. In most branches of ocean traffic steamers must now be working at a very bare margin, if not at a dead loss. Yet the curious thing about the recent demand for ships is the number of ocean cargo "tramps" of all sizes, but especially of large sizes, which have been ordered. The placing of orders for liners is a matter of course, for the liner must be kept up to date, regardless of price, and although orders for new liners may be kept back for a time when the markets are unfavorable, they cannot be kept back indefinitely. But why should the owners of cargo "tramps" begin to buy when prices are not at their lowest, but when freights are nearly so? The explanation is that ship owners could not foresee in the coal and iron markets any appreciable reduction in the price of material within the next year or so, and they cannot find any better investment for their waiting capital. The profits of ship owners on trading and on the sale of their old boats to foreigners during the past two or three years have been considerable, and these profits are now being invested in new ships in the hope of a turn for the better in the freight market. An improvement in freights in the near future, however, seems problematic in view of the production going on in all the ship building countries. But another little war may make all the difference, and of course the natural annual wastage in the world's tonnage becomes every year numerically greater as the mercantile fleets increase and multiply. Last year the effective mercantile marine of the world was reduced by 677,182 tons, through 848 vessels having been wrecked, abandoned, condemned, broken up, etc. I said in my letter of June 2 that in the present state of the freight market, and with evidences of a decline in the volume of commerce all over the world, there is not much encouragement for the building of cargo "tramps." That was so, and that is so. Nevertheless cargo "tramps" are being ordered in quantity and will be built. But the demand at present is more on British than on foreign account. The effect on the prices of material has been marked. Steel ship plates, for instance, which in May were selling here at a good deal under £6 per ton (less the usual discount) are now firm at £6 5s. In this item alone the advance is about 7½ per cent. and other material has advanced proportionately. Anyone wishing to place a contract for a new steamer at the moment will have to pay from 5 to 10 per cent. more (varying according to the class of ship and the time of delivery required) than he could have bought at the beginning of July. Some builders, indeed, are so full they will not book any more for earlier delivery than the end of next year; and the hum of industry is heard in force in all our iron and steel works, which in the early summer were going slow and looking very sick and sorry. Manufacturers of finished iron and steel are just in the reverse position now to that of last year. Then prices for their products were coming down, while the prices of fuel and raw material were going up. Now the prices of finished products are going up while coal is coming down and other material if not coming down is at least at a reasonable level. There is no doubt that prices of English and Scotch iron and steel would be higher but for the competition of German and Belgium makers, who are badly off for orders, and the English and Scotch pig iron would also be higher but for the fear that American iron will again be sent over here in quantity as a consequence of the steel strike.

The revival in our iron and steel industries resulting from the demand for ships might have had the result of checking the decline in coal and in starting it on the up-grade, but for the great falling off in the foreign demand for coal. The exports from Scotland up to this point are about 700,000 tons short of those at the corresponding date of last year. That means, of course, that so much more has to be marketed at home and up till this time the home consumption has been under that of last year. Coal therefore is distinctly "in the dumps," and shipping qualities are now selling from five to eight shillings per ton lower than at the end of August last year. What hurts the coal masters still more is that they cannot get rid of their "smalls" now except at a great sacrifice, whereas last year small coals were selling at a premium. The result is that many collieries which last year were a perfect Klondike are this year working at a loss. Therefore a proposal has been made to reduce wages by sixpence per day, which would bring the wage rate down to just two shillings per day under what was being paid a year ago when coal was six shillings per ton higher. As two shillings per day of wage is only equal to about eightpence per ton of coal at the seam, it will be seen that miners have the best of the position. Still they are resisting the reduction, and unless the conciliative board can reconcile the differences there may be a strike at the end of the month. This possibility has seemed to stiffen prices quite recently—not any increase in the demand for coal, but there is a disposition in some quarters to expect a lifting of coal prices by the American strike.

I have described in former letters some recent additions to the Anchor line of steamers. A further addition is about to be made to the Indian branch of a fleet so well known to Americans. Messrs. Alexander Stephen & Sons of Govan, Glasgow, are to build a screw boat for the Indian cargo and passenger service. She is to be 400 ft. long by 49 ft. beam and 30.9 ft. molded depth, with a dead weight carrying capacity of 7,300 tons. The builders will also supply the engines, which are to be designed for an 11-knot loaded speed at sea.

This seems to recall what is the sensation of the day in the shipping world, namely, the acquisition of the City line by Mr. Ellerman, late of the Leyland line, recently acquired by the Morgan syndicate. This means that Mr. Ellerman is transferring his capital and his energies from the Atlantic to the eastern trade. The City line is of peculiarly Glasgow origin, ownership and management. It began some sixty-two years ago and at first was (like the White Star line) comprised entirely of sailing vessels, loaded in the Clyde (filling up at Liverpool) for Calcutta, Bombay and Kurrachee, from whence they took return cargoes to London and Liverpool. In turn the sailers were replaced by steamers of from 3,000 to 5,000 tons all (like the pioneer sailers) called after the name of some city in Europe or India. The line was founded by the late George Smith, a well known "soft goods" merchant in Glasgow who took his sons into partnership, and the firm has remained Geo. Smith & Sons unto this day. They are a wealthy firm and are selling the ships because they want to get out of business altogether. There are two special features about the City line which I have not seen mentioned in any of the newspaper notices about them. The one is that as the founders were total abstainers the vessels have always been run on teetotal principles and passengers had to carry their own liquor or do without. The other is that as the ships make no call on the home voyage from India to London and carry only choice cargo, they are the favorite vessels of tea shippers and get the bulk of the Indian tea trade. While the transfer of this historic line to Mr. Ellerman at, it is said, the price of close upon one million sterling, is a result of the Leyland deal, it has no direct connection with the deal. In selling the Leyland line to the Morgan syndicate, Mr. Ellerman came under obligations not to enter into the transatlantic trade for a term of years. He is simply going into the eastern trade instead.

The International Engineering Congress is to meet here in the first week of September in connection with the exhibition, when we shall have a gathering of all the foremost engineers from all parts of the world.

BENJAMIN TAYLOR.

SHIP YARD NOTES.

At Reed's ship yard, Ballard, Wash., the new schooner James Nottingham is nearing completion. She is the first of eight sailing vessels to be built at Ballard for the Globe Navigation Co. The vessel is 196 ft. keel, 41 ft. beam, and has a depth of hold of 18 ft. She will have a carrying capacity of 1,000,000 ft. of lumber and is being built especially for the lumber trade. The remaining vessels will be rushed as rapidly as possible.

W. R. Huntley, Parrsboro, N. S., has nearly ready for launching a fine barkentine rigged vessel of about 550 tons register for Capt. Samuel Raynard of New York. The barkentine will have a flush deck to the foremast and is especially built for the South African trade. She will be launched about Sept. 28.

The Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y., will launch the torpedo boat Wilkes on Sept. 28. Miss Elizabeth Wilkes, daughter of Rear Admiral Wilkes, will christen the vessel.

Mr. Frank N. Tandy, general marine agent at Boston, Mass., is receiving subscriptions for a seven-masted steel schooner similar to the one now being built at the Fore River Ship & Engine Co.'s works, Quincy, Mass.

It is reported that the Northern Pacific railway intends to build two steamships for the Pacific and China trade similar in size to those now under way at New London, Conn., for the Great Northern Railway.

The Perth Amboy Dry Dock Co. of Perth Amboy, N. J., has placed an order with the Atlantic Works, Incorporated, of Philadelphia, for an angular band saw machine for ship yard work.

A contract for repair of the Plant line steamer Halifax, recently ashore in Boston harbor, has been awarded to the Harlan & Hollingsworth Co., Wilmington, Del., at $47,000.

TRIENNIAL SESSION OF WEATHER MEN.

The triennial meeting of weather men at Milwaukee last week was probably the most representative meeting of its kind ever held in the United States. Every forecasting officer in the country was present. During the sessions of Tuesday and Wednesday the members read papers bearing upon their work and methods, and presenting the results of their studies and experimentation. All were interesting and some most valuable. The Review will later devote considerable space to the most important of them. The chief of the bureau, Mr. Willis L. Moore, said that it was not only gratifying but really wonderful to see how much useful information had been compiled for the benefit of the whole force. Each man had taken upon himself some particular line of investigation and had followed it to its minutest details. On Thursday noon a session was held at which the topic was "As Others See Us." Short addresses were made by a number of gentlemen who were attending as guests. Mr. James Wilson, secretary of agriculture, was introduced at this session and received a great ovation from the members of the force, who recognize the great influence which he has exerted in developing the efficiency and opportunities of the weather bureau. In the evening a banquet was held at which a number of brief speeches were made, Mr. Harvey D. Goulder speaking for the lake marine interests.

FRIGATE MINNESOTA BROKEN UP.

Another ship of the old navy passed out of Boston harbor last week on her last cruise. The steam frigate Minnesota, a dismantled old hulk, shoved and bunted along by two or three powerful little tugs was started in her journey to Eastport, Me., where she will be broken up and burned. To see her with the sheathing pulled off the upper part of her hull, her smokestack tilted over on one side, it seemed hardly possible that she could be of value to anybody. Yet Thomas Butler & Co., a firm which has purchased and broken up some half dozen of these old war vessels, paid the government $25,738.38 for her. The government has already taken out the composition boxes and other valuable parts of her machinery, and all the copper in sight, so to an outsider the investment seemed a little risky. But her hull is still literally filled with copper. When they built wooden ships it took the output of a small mine to supply one of them. Iron could not be used for bolts, because iron rusted and disintegrated, affecting the wood. Now that copper is worth $300 a ton the present owners of the old Minnesota should realize well on their property. The vessel will be run on the beach somewhere at Eastport, where the ebb and flow of the tide is more marked than in Boston. It will probably take four months to strip her. The old ship was built less than fifty years ago. At Hampton Roads she was flagship of the fleet, and might have shared in the fate assigned to two of her sister ships by the ironclad Merrimac had not the little monitor put in a timely appearance. But this same little monitor, which revolutionized modern fighting ships, helped later to put her as effectually out of usefulness as the Merrimac tried to do. When the new navy came in, the Minnesota went out. It was a gradual process; first as a receiving ship at New York, then as a training ship at Boston, now as so many dollars' worth of old copper.

EXPLOSION OF CITY OF TRENTON'S BOILERS.

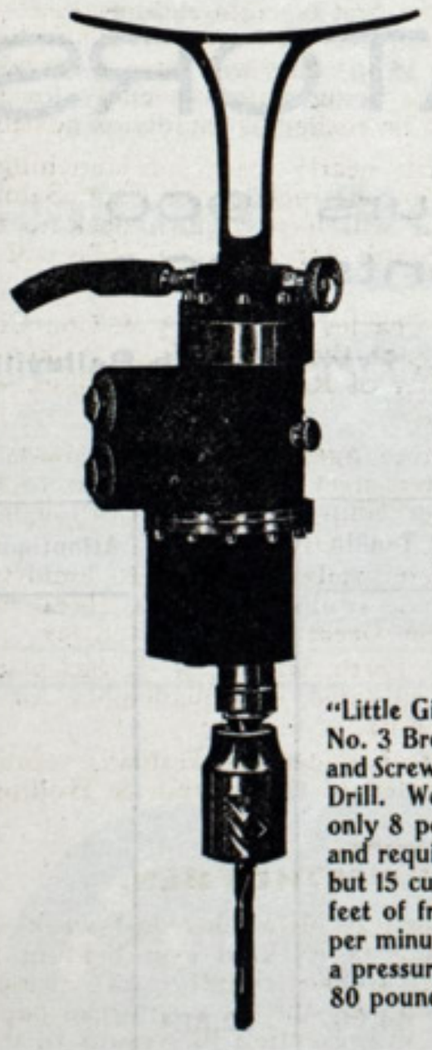
Editor Marine Review: Having read a great deal of nonsense in the newspapers in the last few days in regard to the accident which occurred to the steamer City of Trenton on the Delaware river, I think it is due to the public to correct some of the erroneous statements that have been made by ignorant persons. While the facts of the case have yet to be brought out by the coroner's inquest and the investigation being made by the steamboat inspectors, I think I am in a position to furnish some general information bearing on the subject, as I have had a number of years' experience both as a licensed marine engineer and a designer of marine boilers. First, the boiler was designed and built by a well-known firm, who have built hundreds of boilers, none of which have failed to stand the pressure for which they were designed. The United States steamboat inspectors' rules regulate the strength and pressure of boilers. After completion the boiler is tested by water pressure one and a half times the steam pressure allowed. In this case the steam pressure being 170 lbs. the boiler was tested to 255 lbs. water pressure. After this test the steamboat company is given a certificate stating that they are permitted to carry a pressure of 170 lbs. of steam. The safety valve on each boiler is set and tested to that pressure and could not be altered without about an hour's work. The time is past when the engineer or fireman could hang a grate bar or other weight on the safety valve lever. Boilers are now designed with a factor of safety of about four. This means that the theoretical strength of boiler is equal to four times the steam pressure, according to United States rules. From the foregoing it will be seen that the steamboat company was justified in carrying 170 lbs. pressure on these boilers, regardless of whether they were racing or not, as the best engineering practice is to carry full boiler pressure at all times as being more efficient and more economical. As it is generally much more difficult to hold the full boiler pressure when going at full speed than when going slow, there is less chance of having the highest pressure if the boat is racing, and the safety valve would prevent any excess of pressure over that allowed. All the Atlantic greyhounds, as well as the slower ships, make it a rule to carry the boiler pressure as high as the safety valves will permit. Practically speaking, there is less danger in carrying a steady high pressure than a fluctuating pressure, which is sure to go to the limit allowed by safety valves, when from lack of use they may become stuck in the seat and fail to go off at the proper time. There are a good many old boilers in existence today carrying lower pressures, that pass inspection under the present rules for half the pressures they are now carrying. All our locomotives are built of much lighter material than would pass the United States rules for marine boilers. H. BLOOMSBURG.

Newport News, Va., Sept. 2, 1901.

JOY STEAMSHIP CO.

One of the transportation concerns of New York that makes no pretentions of greatness, but which has been steadily building up a substantial freight and passenger business, is the Joy Steamship Co., with general offices at pier 35, East river, New York. This company operates a daily line of passenger and freight boats between New York city and Providence, R. I., and also maintains a semi-weekly service between New York city and Boston, Mass. It was established only three years ago but has already achieved remarkable success. The company steamers sail from the pier above referred to and patrons can feel assured in advance of courteous treatment and good service. The sailings afford passengers a daylight view both of Long Island sound and Narragansett bay. This is certainly one of the most delightful trips along the eastern coast.

The success, or lack of success, of propeller wheels is largely attributable to the care, or lack of care, in fitting the conditions of each particular case. Especial attention is given that very important subject by the Marine Iron Works, station A, Chicago, resulting in their being in receipt of many orders for propeller wheels within their range of sizes (18 in. to 6 ft.), and in the speed, cruising or towing patterns, as may be required. 6



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has an ominous sound, but, in this case, it represents a liberal offer. We offer you a 30 days' trial of any **"Little Giant"** Pneumatic Tool, and we pay all the costs of transportation, even if you send it back. That's "thirty days and costs" on us.

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"Little Giant" Pneumatic Tools have won a world-wide reputation for simplicity, durability and economy in the use of air, and are supplanting the ordinarily good pneumatic tools in many shops. They are small and compact, easily handled and operated and are made entirely of steel.

Send for our catalog, which illustrates and describes our entire line of Drills, Hammers, Riveters, Hoists, and other Pneumatic Tools and Appliances, and choose the tool you'd like to try. Do it to-day.

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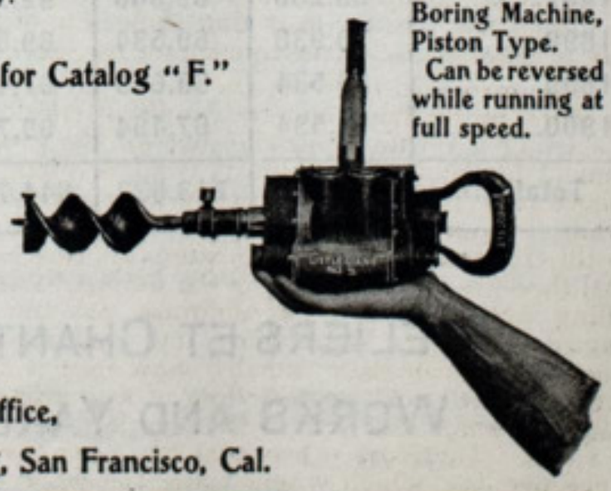

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423 Emma Spreckels Building, San Francisco, Cal.

NEW GRAIN ELEVATOR AT PORT ARTHUR.

The elevator which is being built at the southwestern end of Port Arthur, Ont., for the Canadian Northern railway, is located out in the water nearly half a mile from shore. The elevator is 100 ft. wide, 250 ft. long and 175 ft. high above water line. The storage capacity is 1,250,000 bushels. The unloading capacity is 250 cars a day and the loading capacity into steamships 100,000 bushels an hour. The elevator is of semi-fireproof type, having a large amount of steel and concrete in its construction; and all wood used, both inside and outside the building, is covered with sheet steel. A minimum rate of insurance will thus be obtained. The foundation consists of 3,500 piles, driven in clusters of twelve, fifteen and twenty each. The piles are cut off 2½ ft. under water, then capped with hardwood grillage plank 8 in. thick, which completely covers the top of clusters. On this concrete piers are carried to 8 ft. above water level. A heavy frame story, 24 ft. in height, forms the workfloor of the elevator, through which two railway tracks run. Ten cars of grain can be unloaded simultaneously by means of ten pair of automatic car shovels. On this floor is also erected the cleaning machinery and cleaners, car haul for moving cars, and many other special appliances. Below the workfloor is an 8-ft. basement, having a cement floor. Immediately above the workfloor are located the hopper bottoms of the bins, which are all built by patented fireproof system of steel bands and cement, being in the shape of an inverted pyramid, so that the bins will be absolutely smooth and self-cleaning. From the top of the hopper bottoms the bins extend to a height of 70 ft. The majority of the bins are 14 ft. square by 70 ft. deep, but a number are subdivided to form smaller ones for the storage of small lots of grain. Above the bins is the cupola, which runs the full length of the building, and which is 42 ft. wide by 68 ft. in height. It consists of four stories, the top one being called the lofter head floor. On this story is situated the top of all the lofters and elevating legs, by means of which the grain is carried from tanks in the basement and discharged into the garners in the story below. The grain from each leg can be discharged into either of two garners by means of switch valves. The story below the lofter head floor is called the garner floor. Here are located the ten garners, each capable of holding 84,000 lbs. of grain, or more than a full carload. The next story below this is called the scale floor, where are located ten hopper scales, each capable of holding and weighing 84,000 lbs. of grain. Below the scale floor is the distributing floor. In this story are located the revolving distributing spouts, connected with each scale, they in turn being connected with the permanent system of spouting, leading from a ring to the different storage bins, so that the grain from each scale can be distributed into twenty-one different bins. The revolving distributing spout is carried on a vertical shaft resting on ball-bearing step, the spout being counterweighted so that when no grain is passing through it, it raises free from permanent spouting, but on the grain being let down from the scales the revolving spout is weighed down, making a tight connection with the spouts. This revolving spout is connected by light flexible steel cables with a hand wheel and pointer and dial on the scale floor, and is under the perfect and accurate control of the weighman without his having to leave his scale. Connected with this spout is also a lock-up device, connection with which also leads to the scale floor, so that spout once being connected cannot be moved except by the operator on the scale floor. Connection from the switch valve on the lofter floor is aso brought down to the scale floor, so that the whole operation of handling and distributing the grain in the cupola is under control of the weighman without leaving his scales. This is claimed to be unquestionably the most perfect system of grain distribution used in any elevator.

The machinery consists of main shaft running the full length of the elevator, located in the basement. All machinery is driven direct from this shaft by rope transmission. Connected to each driving pulley on this shaft is a friction clutch, so that each separate piece of machinery can be stopped or started at will. On the workfloor are located three lines of shaft, two to operate automatic car shovels, and one for operating cleaner machines. In the cupola there are no long shafts, each of the elevating legs being driven direct from the main shaft in the basement, by rope drive, to large grooved pulleys at the head of the leg. This avoids any undue friction of machinery by using short shafts only. All bearings are of the highest type of genuine ball and socket ring oiling bearings, which will run on an average six months with one filling of oil. The whole of the machinery is of the very highest class that can be manufactured.

The power plant is located in a brick power house at the end of the elevator, 45x60 ft. in size, and 17 ft. high. In the power house is located one 750 H. P. engine, three boilers, condenser, boiler feed pump, and one 1,000 gallon underwriters' fire pump; also one 35 H.P. automatic engine, electric generator of 35 K.W. direct connected to shaft of engine; also marble panel switch board, etc. At the end of the power house is located a brick chimney 170 ft. high, having 4½ ft. flue. The outside size at base is 14 ft. square to a height of 20 ft., where the shape changes from square to octagon, and from octagon to round, the round part of the chimney being 150 ft. high, 13½ ft. at the bottom and tapering to 8 ft. at the top.

The whole exterior of the elevator is covered with corrugated sheet steel, and all interior woodwork is covered with crimped sheet steel. All floors are of steel and concrete, and this with the steel and concrete hopper bottoms ensures a practically fireproof elevator. Plans and specifications for the building were prepared by J. A. Jamieson of Montreal, who also secured the contract for construction. All the machinery and special labor-saving appliances, as well as the system of fireproofing, are of his design. On account of a large amount of dredging being required before the foundations could be put in, work was late in getting started, but it is now being rushed with a view of getting the elevator ready to handle this season's crop.

Naval Constructor H. C. Gillmor of the United States navy, who was recently ordered to Havana to examine the floating dry dock bought from Spain, estimates that about $40,000 will be required to put the dock in good condition and asks that a regular dock force be sent to Havana to man the dock.

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Originated 1849 — Latest Improvements 1896

Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890.....	67,728	2,460										
1891.....	68,247	68,331	204									
1892.....	68,247	68,403	69,822	23,259								
1893.....	68,379	68,343	68,286	68,247								
1894.....	68,439	68,367	68,574	68,439	37,701							
1895.....	68,673	68,766	68,739	68,808	40,887	28,713						
1896.....	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897.....	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898.....	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899.....	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900.....	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
Total.....	757,503	713,637	644,784	597,423	387,519	356,376	292,683	209,514	172,182	128,730	85,950	52,140

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TELEGRAPHIC ADDRESS: BELLEVILLE, SAINT-DENIS-SUR-SEINE.

HALIFAX WANTS A SHIP YARD.

The citizens of Halifax are especially desirous of having a ship yard located in that city. At a recent meeting a circular was prepared for publication setting forth the advantages of Halifax as a site. The circular will be widely published later. Following are some of the points noted in it:

Labor.—We have here the largest stable population in the maritime provinces, affording first-class, intelligent men from whom to draw the necessary mechanics and artisans.

Material and Fuel.—We have in Nova Scotia, or soon will have, the means of assembling the material required in the construction of shipping, and we are close to supplies of fuel as cheap as obtainable anywhere.

Harbor.—Halifax harbor is large, open the year round, and has the advantage of the protection of strong fortifications, a factor that sometime might be important.

Climate.—Uniform weather, less severity in winter and no great heat in summer give a greater number of working days throughout the year than are available elsewhere.

Repair Work.—Halifax harbor's geographical location is favorable for the obtaining of much repair work. It is conveniently situated for shipping that may be damaged at sea and require repairs. We have already a magnificent dry dock.

Market.—There is a growing tendency among provincial investors to put money into shipping, and other things being equal, into shipping constructed at home. A large fleet is required for the carrying of our own coal and iron. Our fishing vessels may and should be constructed of steel. There is a demand for shipping to supply our coastwise and passenger requirements.

Bonuses.—The city of Halifax offers $200,000 and the province of Nova Scotia $100,000. For the other side of the harbor $100,000 is offered by the town and the province offers $100,000.

A letter from a New York correspondent tells of progress made recently in the manufacture and sale of the Paragon type of boiler, patented by Capt. M. De Puy of No. 19 South street, New York. The canal steamer Queen, a new vessel owned by W. J. Warwick, is equipped with one of these boilers of 6½ ft. width and 8 ft. length, with 1,050 sq. ft. heating surface. The Queen, which has just arrived in New York, had in tow from Buffalo three consorts, each carrying 240 tons. The showing made is very gratifying to the owner, who is especially pleased on account of the small amount of fuel consumed. Another boiler shipped recently is for parties in Astoria, Wash., and is 5 ft. wide and 7 ft. long. The same parties have also placed an order for a boiler 6 ft. wide by 10 ft. long. Mr. Charles L. Riter of Riter Bros. Co., Buffalo, says the Paragon is the most rapid steaming boiler he ever fired up in his shop. An order has recently been received for a boiler 5 ft. wide by 7 ft. long from parties at Tampa, Florida. Capt. De Puy is considering an offer relating to the sale or control of the boiler west of the Mississippi river, and it is very probable a deal of this kind will be made in the near future.

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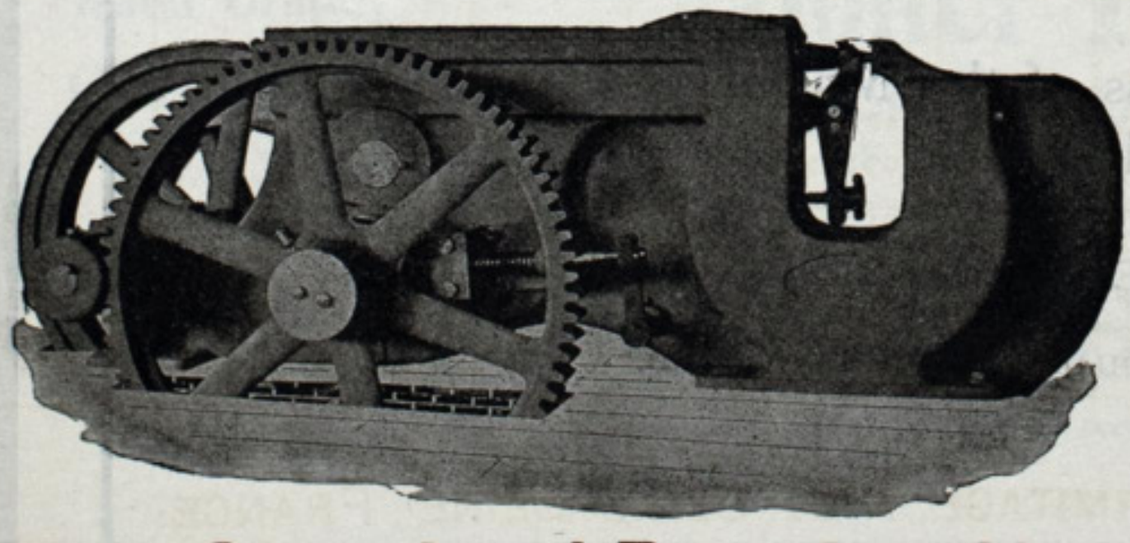

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The book is bound in white duck and stamped with blue ink and is most fetching to the eye. Between its covers 500 pages are devoted to defining the meaning of words in nautical literature. If there is a word in that ought to be out, or a word out that ought to be in, we should know it. We don't think there is.

The book is of vital interest to nautical students, men of the merchant marine and navy, masters and engineers, admiralty lawyers and everyone concerned about the building and operation of a ship.

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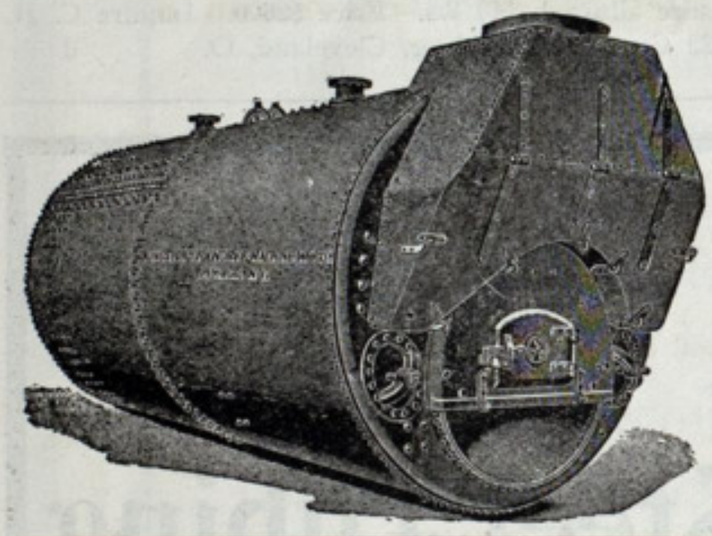

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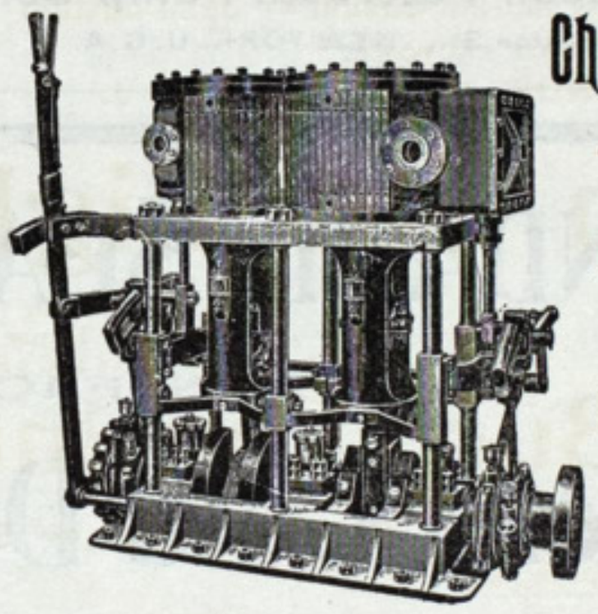

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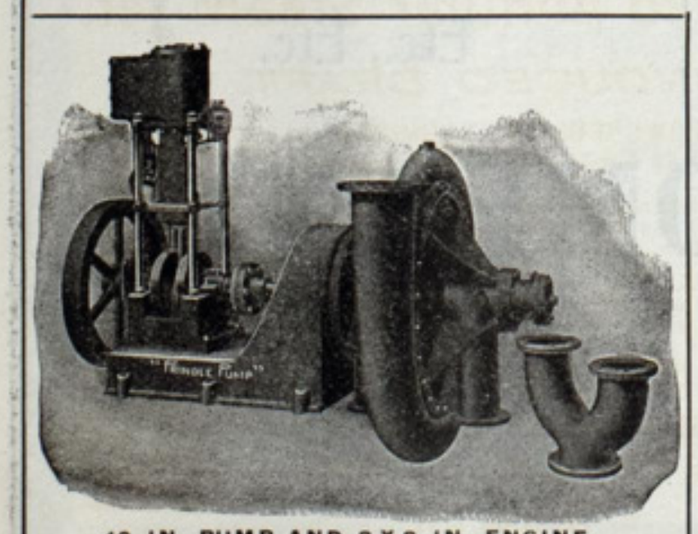

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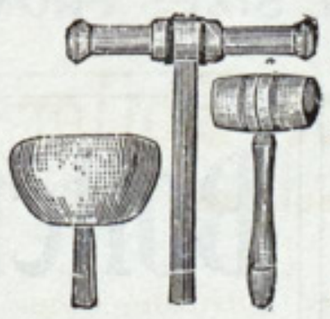

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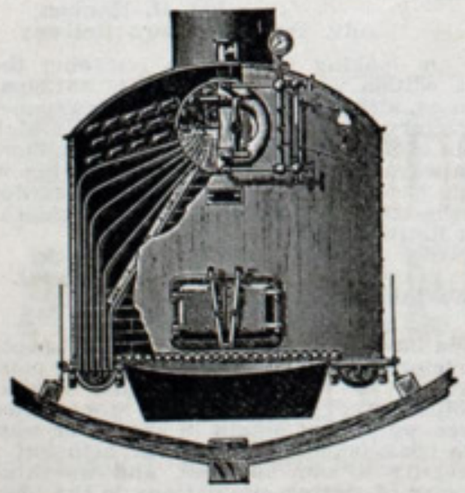

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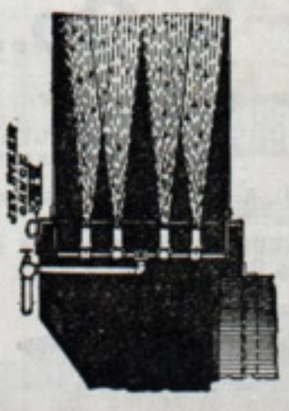

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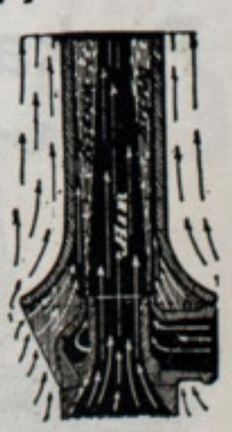

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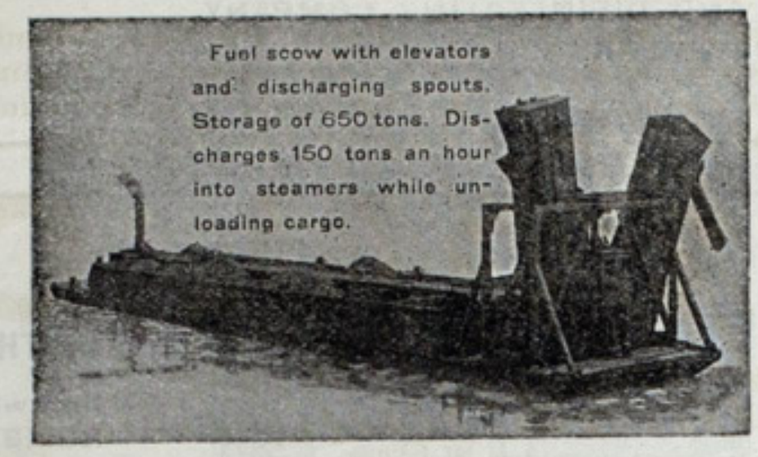

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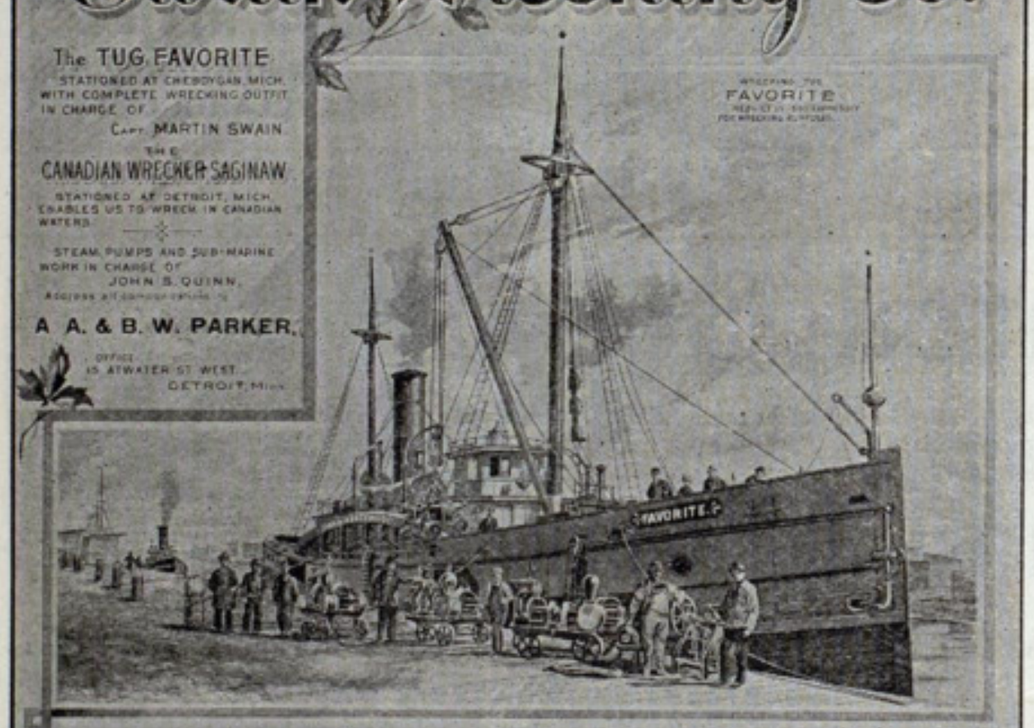

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Buffalo, N. Y., July 24, 1901.
R. V. Pierce, M. D.,
President World's Dis. Med. Ass'n.

VERMONT.

The American Newspaper Directory stands, as it has always stood, the first and best of newspaper directories—the only one which cannot be ignored, the only one which every advertiser must have. No other can take its place; no other is needed—Joseph Auld, in the Burlington (Vt.) News of July 3, 1896.

ADVISOR.

The Advisor accepts the American Newspaper Directory as the standard in newspaper ratings. The obstacles which obstruct its efforts to get true and reliable information are many.

* * * *

The directory question is one which interests every publisher in the country—nay, the entire world. But in the United States directories are becoming altogether too numerous. In this, as with other books of reference, it is necessary to have one which may be relied on as being an authority on the matter of newspaper circulations. There can be no question about the fact that at this time, as for many years past, the American Newspaper Directory is that authority. The Advisor is not paid to make this announcement. It makes the statement in the interests of advertisers and publishers because it is true. One thing the advertiser is almost cock-sure of when he refers to the American Newspaper Directory is that the circulation figures he sees therein are not overstated to any great extent. In most other directories they are. Only the publisher himself is to be blamed for not securing a proper rating in that publication, and every advertiser of consequence knows it. Thus the publisher who refuses to furnish a statement places himself under a reasonable suspicion.—The Advisor for June.

New York, June, 1901.

CHICAGO.

Messrs. Geo. P. Rowell & Co.'s American Newspaper Directory has long since earned the reputation of being the best of its character. It contains the results of patient, expensive and systematic effort to secure all attainable information of interest concerning American newspapers. The work has been honestly done. This will not be questioned by any unprejudiced examiner. The most important question is circulation. In attempting to give this information the editor of the Directory encounters his most difficult work. It is the aim and necessity of the Directory to give the truth. The American Newspaper Directory is to-day the dependence and guide, in a greater or less degree, of every large advertiser in the country.—Chicago (Ill.) Daily News.

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Charles Austin Bates.
New York, June 24, 1901.

PABST.

If the improvement of the American Newspaper Directory continues in the future as it has during the past twenty years I do not think I shall live long enough to see any other directory take its place. There will, however, be the usual crop of directories, just as every other good thing is imitated. Your long years of experience in dealing with evasive circulation reports have most admirably fitted you for placing a proper valuation upon such statements. Advertisers have come to know that the Rowell estimates are nearer the proper figure than can otherwise be obtained. The American Newspaper Directory is therefore indispensable in every well regulated advertising department. Lines are being more tightly drawn every day; it is difficult to collect for twenty thousand when you print only eight. If the advertiser were buying barley he would not accept three pecks for a bushel, although the quality might at all times be open for discussion.

The American Newspaper Directory is the guide and companion of the advertising man, and it is to the interests of all concerned to help perfect it, support it and hurrah for it.

Pabst Brewing Co.,
J. R. Kathrens, Adv. Mgr.
Milwaukee, Wis., June 7, 1901.

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Artemas Ward,
Advertising Manager for Sapolio.
—In Fame, March, 1901.

WASHINGTON.

Every page of the American Newspaper Directory breathes the desire of its publishers that it shall be absolutely correct in every statement it makes.

Truly yours, Frank Roe Batcheld,
Clerk of the Committee on Banking and Currency, House of Representatives, U. S.
Washington, D. C., Jan. 17, 1899.

SOUTHERN.

We subscribe to and pay cash for the American Newspaper Directory, and find it of great value in our advertising department. We have 6,892 miles of railway, extending from Washington, D. C., all over the South, and in advertising this system we use more than 1,000 publications, and in selecting this list we find that we get a correct idea of circulation from this Directory that can not be obtained from any other similar publication. We receive other newspaper directories gratis; but the fact that we pay cash for this one in addition shows that we can not place the same dependence upon the "free list."

We thoroughly appreciate the careful manner in which this Directory is compiled.

Washington, D. C., Sept. 13, 1900.
Jos. H. Hannen,
Adv. Dept. Southern Railway.

I am looking forward to receiving the new edition with a great deal of anticipation as, although the American Newspaper Directory seemed to have reached a high state of perfection several years ago, there is always something new and of value in each succeeding edition. It is regarded as the standard authority with the Southern Railway.

S. H. Hardwick,
General Passenger Agent.
Washington, D. C., May 21, 1901.

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Katzenstein, L. & Co.....New York.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.
Paul & Co., J. C.....Chicago.

MILLING MACHINES OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

NAVAL ARCHITECTS.
Gaskin, Edward.....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Crane Co.....Chicago.
Garlock Packing Co.....Palmyra, N. Y.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Sayen & Schultz.....Philadelphia.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Toch Bros.....New York.
Upson-Walton Co.....Cleveland.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PIPE THREADING AND CUTTING MACHINES.
Merrell Mnfg. Co.....Toledo, O.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.
Crane Co.....Chicago.

PLANERS OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PLATE BENDING AND PLANING MACHINES.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

PLUMBING, MARINE.
Reilly Repair & Supply Co., James.....New York.
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston.
Paul & Co., J. C.....Chicago.

PRESSURE REGULATORS.
D'Este Co., Julian.....Boston.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash
Hyde Windlass Co.....Bath, Me
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.

PROJECTORS, ELECTRIC.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Wood, R. D. & Co.....Philadelphia.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood, R. D. & Co.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Automatic Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

R. I. W. DAMP RESISTING PAINT.
Toch Bros.....New York.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER GOODS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

RUBBER INSULATED WIRES.
Roebling's Sons, John A.....New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SEAM COMPOSITION AND ELASTIC SEAM PAINT.
Cole & Kuhls.....Brooklyn.

SEARCH LIGHTS.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

SHAPERS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Trigg, Wm. R. Co.....Richmond, Va.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Moran Bros. Co.....Seattle, Wash.
Reilly Repair & Supply Co., James.....New York.
Upson-Walton Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.
Algoma Central Co.....Sault Ste. Marie, Ont.
American Line.....New York.
Cleveland & Buffalo Transit Co.....Cleveland.
Dominion Line.....Boston.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL CASTINGS.
Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mnfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

SUBMARINE DIVING APPARATUS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

SURVEYORS, MARINE.
Gaskin, Edward.....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.

THERMOMETERS FOR MECHANICAL PURPOSES.
Helios-Upton Co.....Peabody, Mass.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.
Standard Pneumatic Tool Co.....Chicago.
Watson-Stillman Co.....New York.
Wood, R. D. & Co.....Philadelphia.

TOOLS, WOOD WORKING.
Atlantic Works, Inc.....Philadelphia.

TOPOPHONE—Prevents disasters in fogs.
Colt Co. J. B.....New York.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

TRAPS, STEAM.
D'Este Co., Julian.....Boston.
Haines Co., Wm. S.....Philadelphia.

TRUCKS.
Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.
Benedict & Burnham Mnfg. Co.....Waterbury, Conn.
Standard Seamless Tube Co.....Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crane Co.....Chicago.
Crosby Steam Gage & Valve Co.....Boston.
D'Este Co., Julian.....Boston.
Jenkins Bros.....New York.
Wood & Co., R. D.....Philadelphia.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hall & Root.....Buffalo.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Kennedy Hunter & Co.....Antwerp.
Mitchell & Co.....Cleveland.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Tandy, Frank N.....Boston.

VENTILATING APPARATUS FOR SHIPS.
American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A.....New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
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No. 22, Lake Shore Limited	*2 15 am	*2 20 am
No. 26, Pan-American Express	*5 50 am	*6 00 am
No. 28, New York & Boston Express	*7 40 am	*8 00 am
No. 32, Fast Mail	*11 25 am	*11 30 am
No. 44, Accommodation, via Sandusky	†1 35 pm	.....
No. 46, Southwestern Express	.....	*3 00 pm
No. 6, Limited Fast Mail	*5 40 pm	*5 45 pm
No. 10, Chicago, New York & Boston Special	*7 35 pm	*7 40 pm
No. 16, New England Express	*10 30 pm	*10 35 pm
No. 2, Day Express	†9 05 pm	†11 30 pm
No. 126, Norwalk Accommodation	†7 55 am	.....
No. 40, Toledo & Buffalo Accom., via Norwalk	†10 00 am	†11 40 am
No. 106, Conneaut Accommodation	.....	†4 30 pm
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No. 11, Southwestern Limited	*3 25 am	.....
No. 15, New York, Boston & Chicago Special	*3 05 am	*3 10 am
No. 21, New York & Chicago Express	*5 10 am	*5 20 am
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No. 3, Fast Mail Limited	*10 50 pm	*10 55 pm
No. 115, Conneaut Accommodation	†8 30 am	.....

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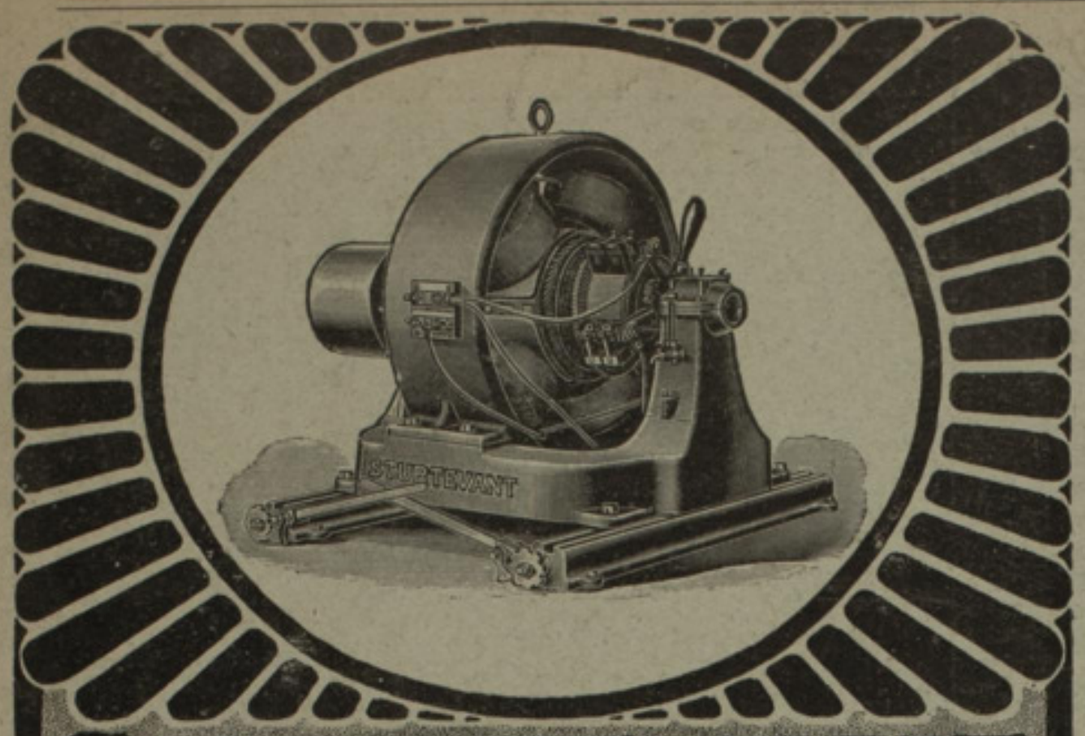

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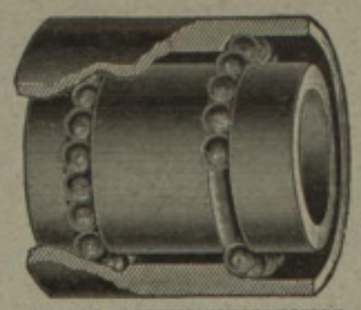

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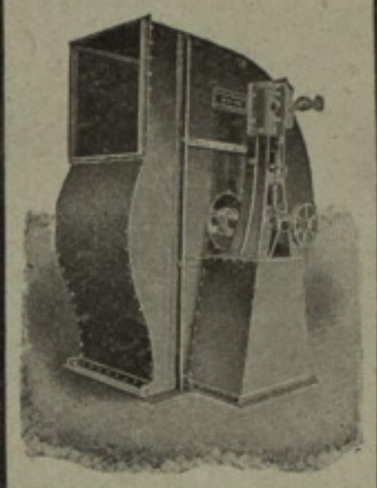

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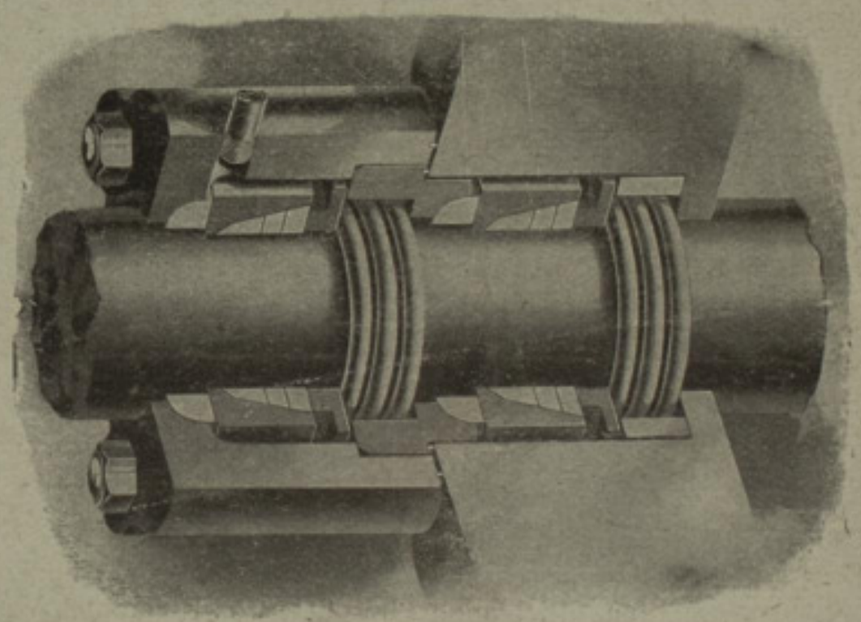

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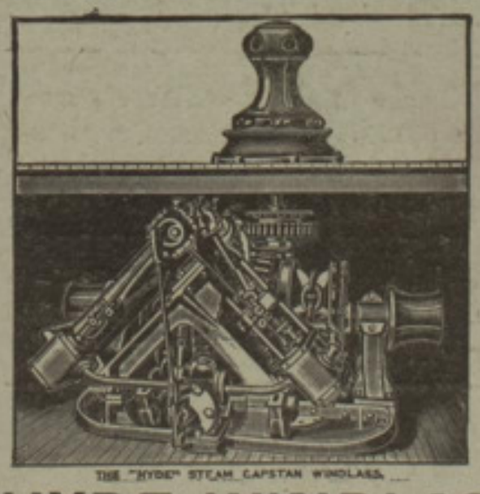

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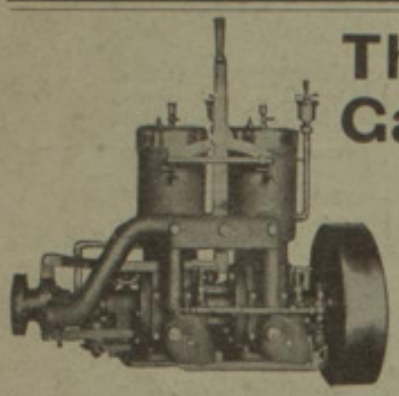

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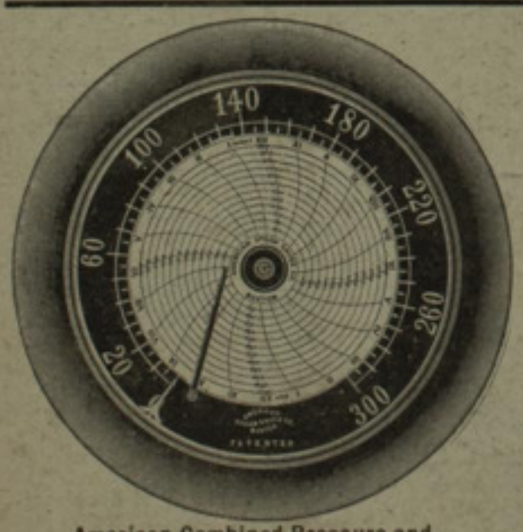

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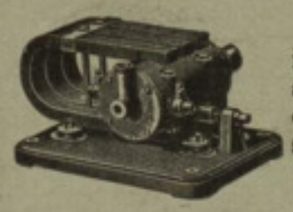

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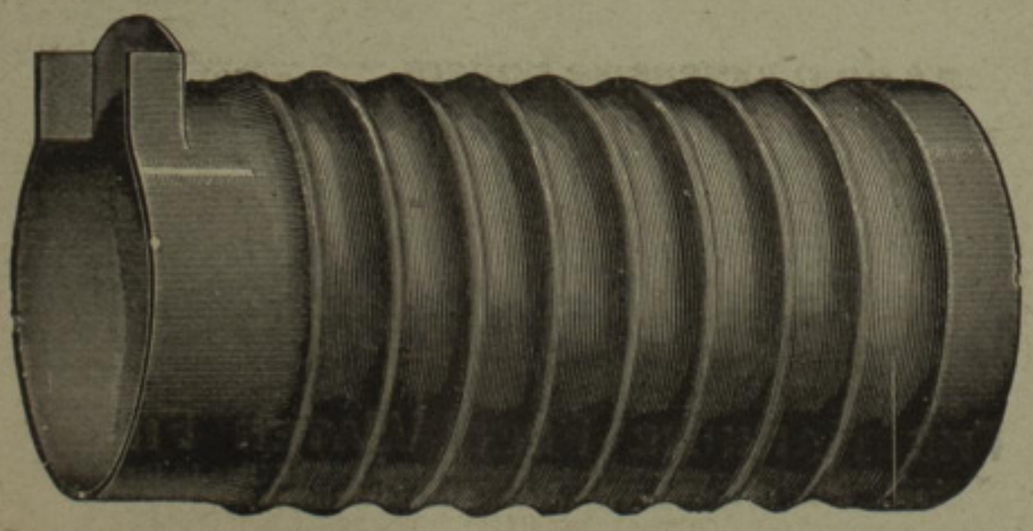

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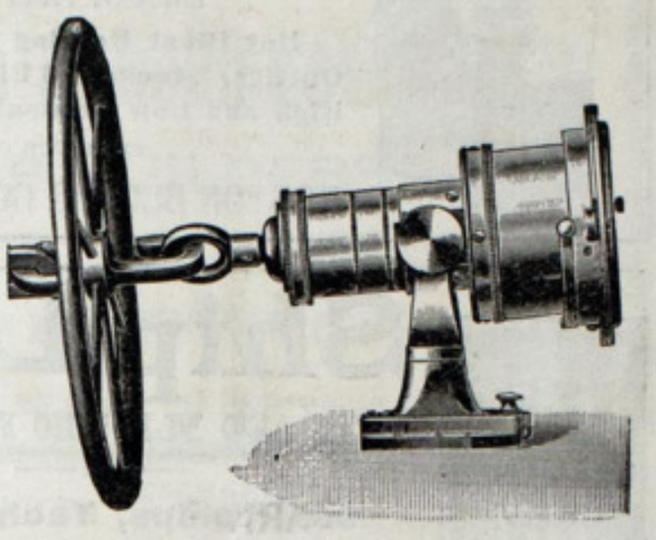

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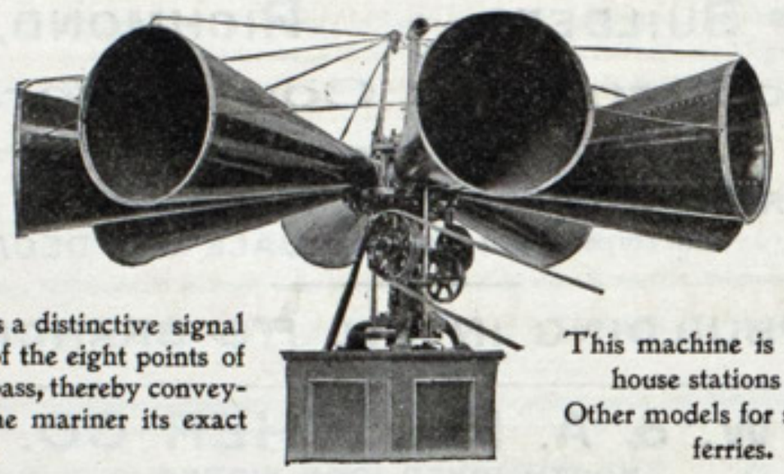

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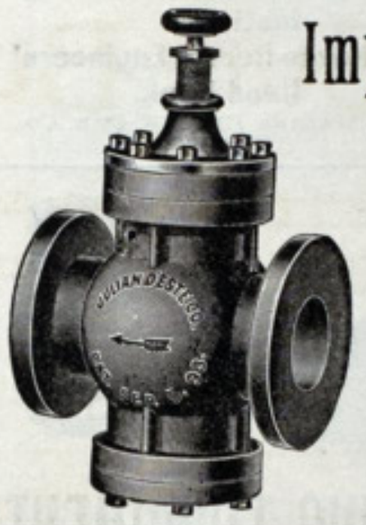

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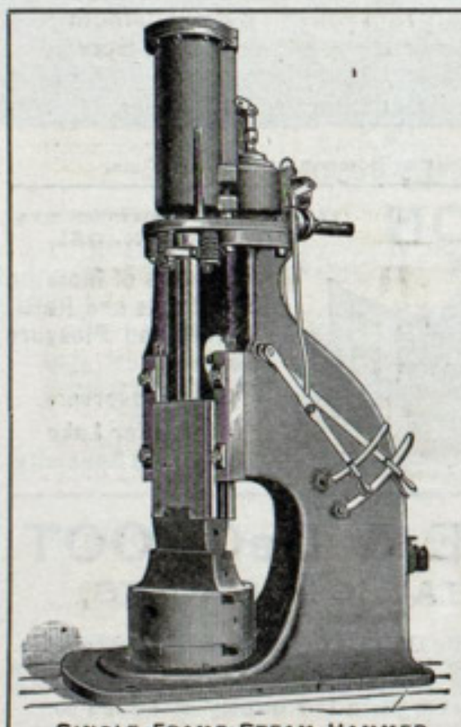

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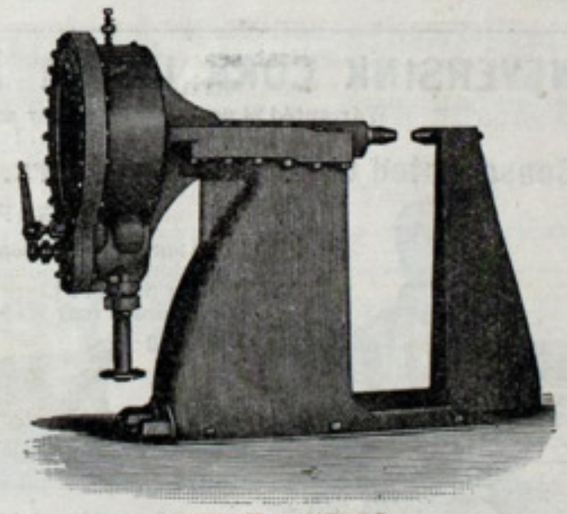

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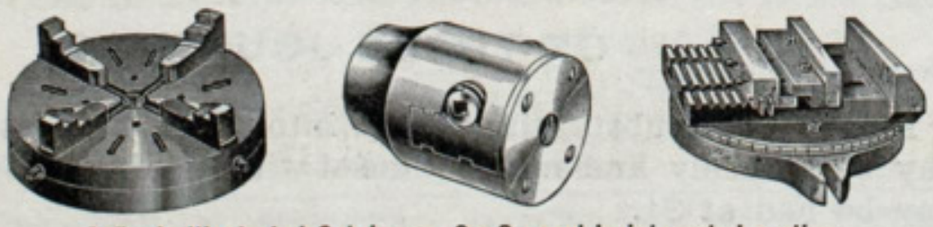

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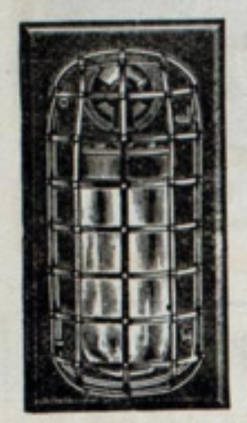

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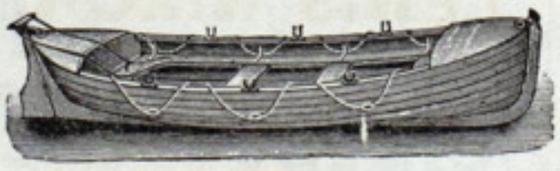

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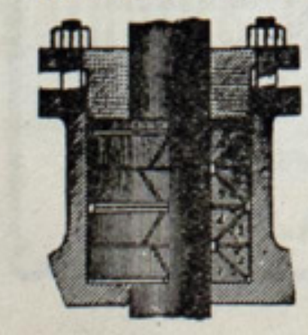

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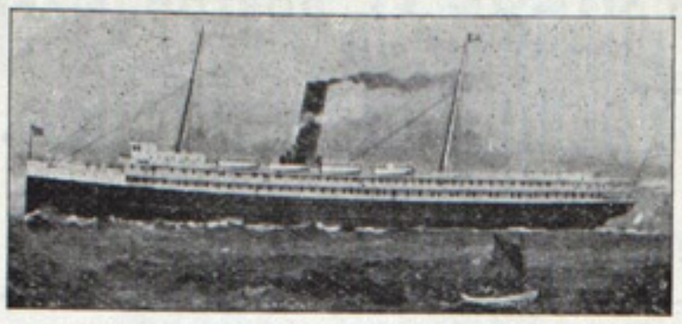

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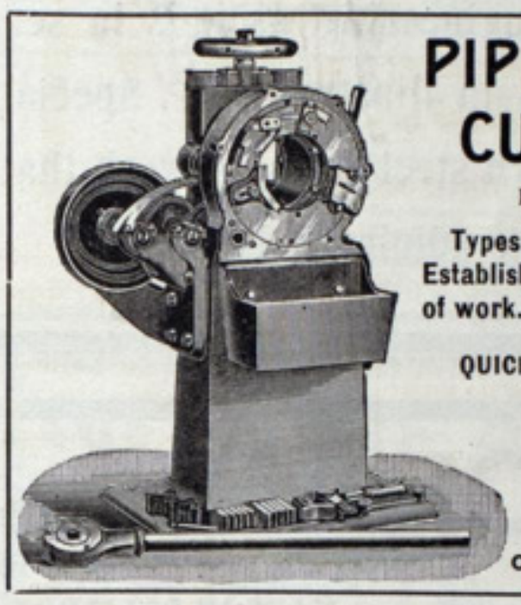

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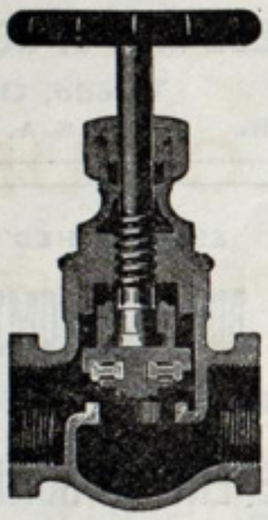

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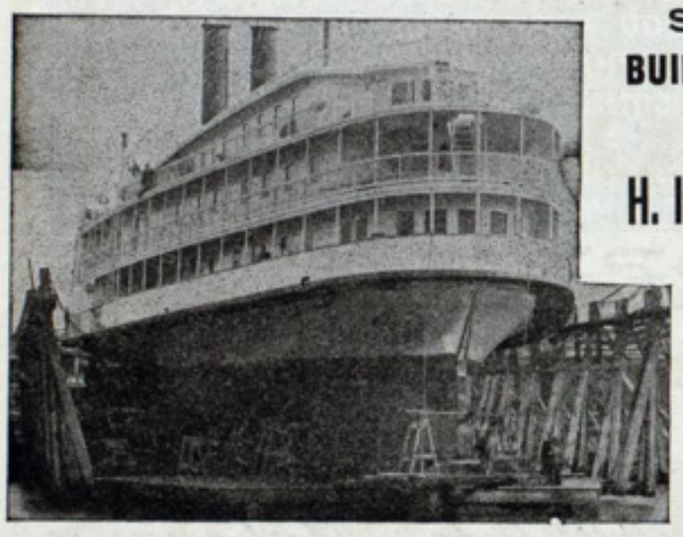

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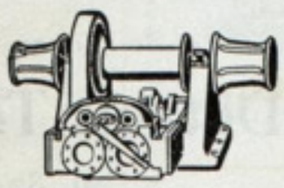

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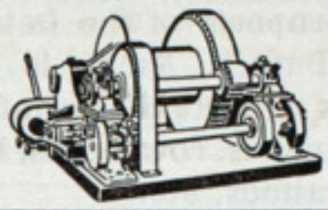

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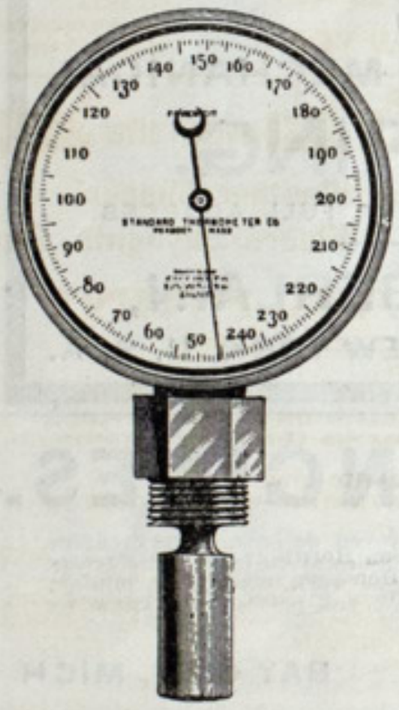

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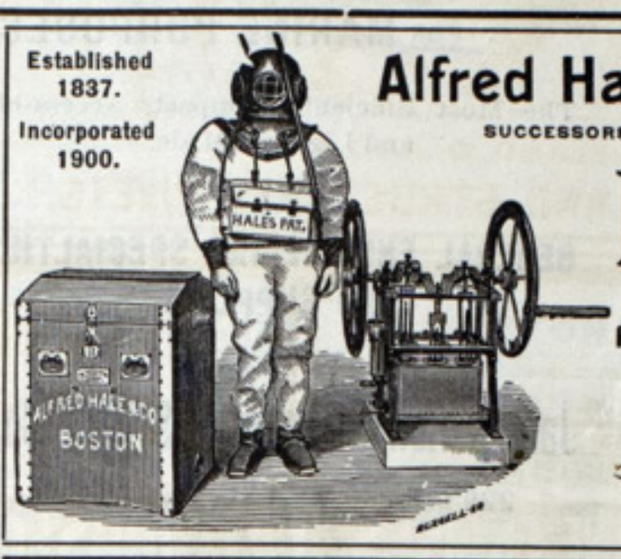

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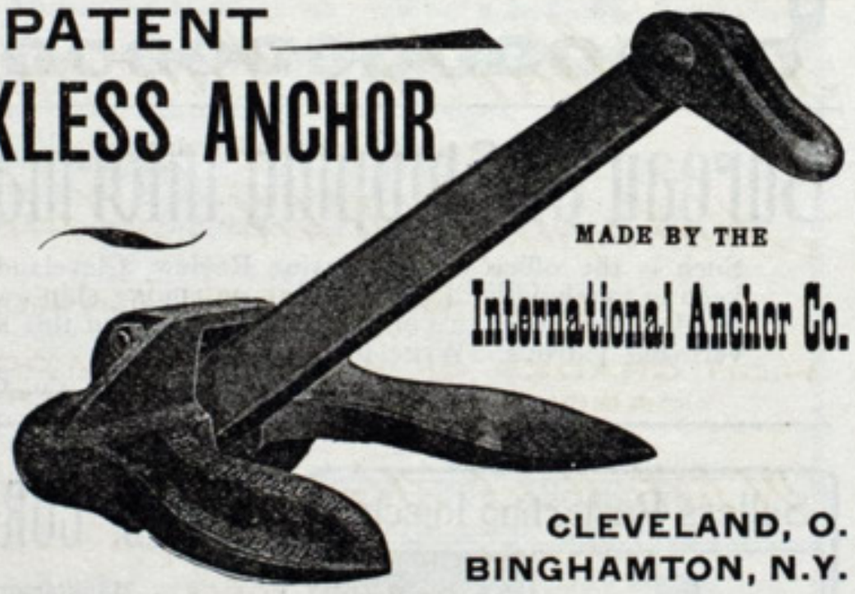

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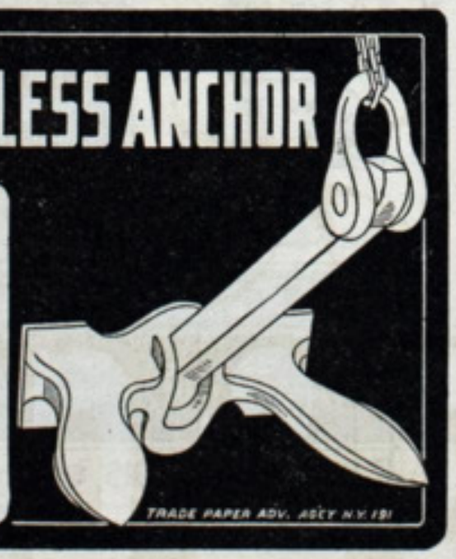

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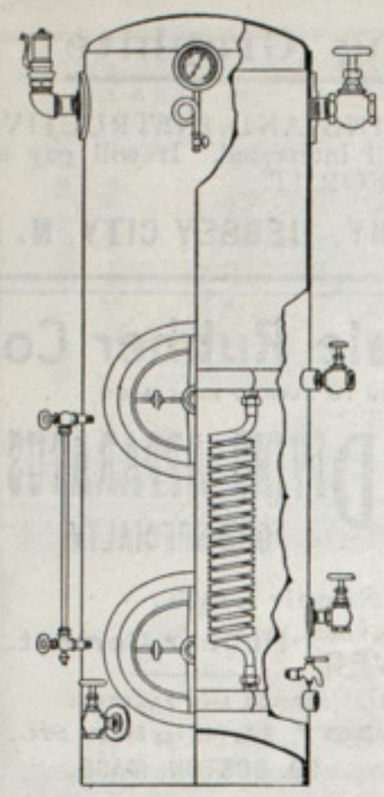

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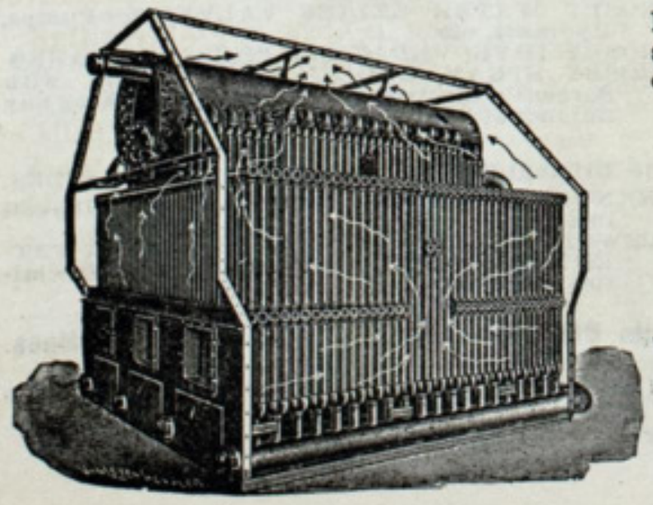

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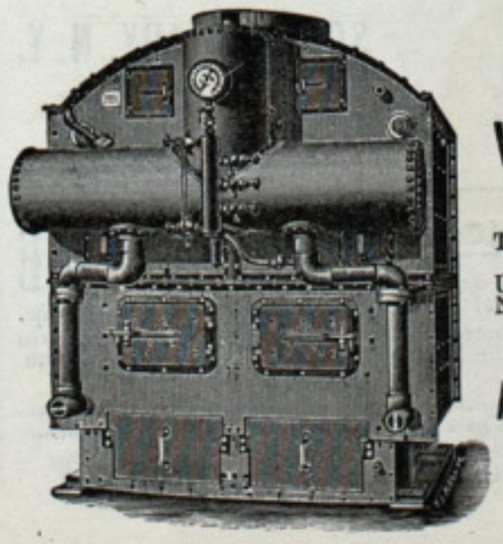

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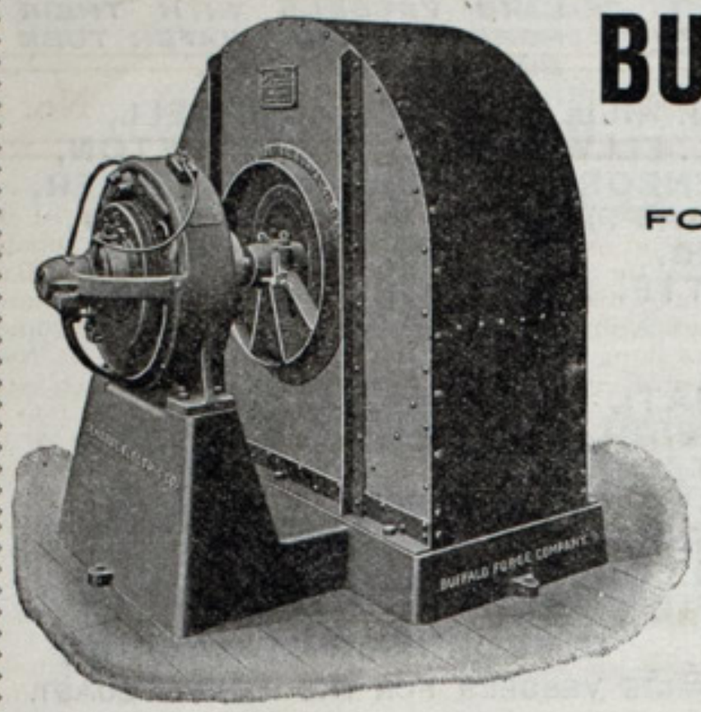

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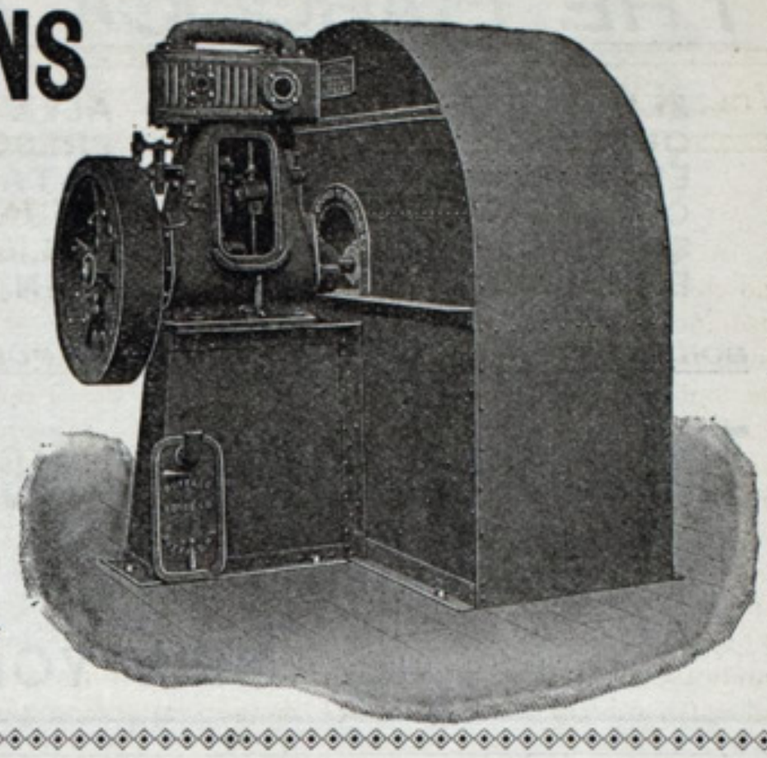

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